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Amateur 73 Radio Today

40th Anniversary
Souvenir Edition

OCTOBER 2000
ISSUE #479
USA \$3.95
CANADA \$4.95

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El Supremo & Founder
Wayne Green W2NSD/1

Associate Publisher
F. I. Marion

Executive Editor
Jack Burnett

Managing Editor
Joyce Sawtelle

Technical Editor
Larry Antonuk WB9RRT

Contributing Culprits
Mike Bryce WB8VGE
Jim Gray II
Jack Heller KB7NO
Chuck Houghton WB6IGP
Andy MacAllister W5ACM
Joe Moell K0OV
Steve Nowak KE8YN/5
Dr. Rick Olsen N6NR

Advertising Sales
Evelyn Garrison WS7A
21704 S.E. 35th St.
Issaquah WA 98029
425-557-9611
Fax: 425-557-9612

Circulation
Frances Hyvarinen

Data Entry & Other Stuff
Norman Marion

Business Office
Editorial - Advertising - Circulation
Feedback - Product Reviews
73 Amateur Radio Today Magazine
70 Hancock Rd.
Peterborough NH 03458-1107
603-924-0058
Fax: 603-924-8613

Reprints: \$3 per article
Back issues: \$5 each

Printed in the USA

Manuscripts: Contributions for possible publication are most welcome. We'll do the best we can to return anything you request, but we assume no responsibility for loss or damage. Payment for submitted articles will be made after publication. Please submit both a disk and a hard copy of your article (IBM (ok) or Mac (preferred) formats), carefully checked drawings and schematics, and the clearest, best focused and lighted photos you can manage. "How to write for 73" guidelines are available on request. US citizens, please include your Social Security number with submitted manuscripts so we can submit it to you know who.

THE NEW! 73 Amateur Radio Today

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QRX . . .

Jim Gray W1XU/7 SK

We note with considerable sadness the passing of longtime 73 friend and employee Jim Gray W1XU/7 on June 30. While our ham ranks have been filled with many a fine gentleman throughout the decades, surely none was more so than Jim. And what a life he led.

No doubt a portent of things to come, Jim's birth on June 12, 1927, came just a month after Lindbergh flew the Atlantic. Jim was first licensed as a pilot at the age of 16, in 1943, and continued to fly until 1990. He held both a private power rating for aircraft and a commercial glider license, and

spent 16 years flying gliders out of Harris Hill in Elmira NY.

An army veteran of both WWII and later Korea (which often befuddled those who swore he had to have been Air Force), Jim got his first ticket in June 1950 as a Class B ham with the callsign W2EUQ. For this, he had to pass a 13 wpm code test (one minute solid copy required), and an essay-type technical examination where circuit drawing from memory was required.

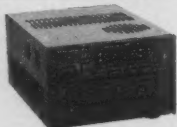
The Class B ticket allowed CW on all bands 160-10, and phone privileges on 160, 11, and 10 meters,

Continued on page 6

73 Amateur Radio Today (ISSN 1052-2522) is published monthly by 73 Magazine, 70 N202, Peterborough NH 03458-1107. The entire contents ©2000 by 73 Magazine. No part of this publication may be reproduced without written permission of the publisher, which is not all that difficult to get. The subscription rate is: one year \$24.97, two years \$44.97; Canada: one year \$34.21, two years \$57.75, including postage and 7% GST. Foreign postage: \$19 surface, \$42 airmail additional per year, payable in US funds on a US bank. Second class postage is paid at Peterborough, NH, and at additional mailing offices. Canadian second class mail registration #178101. Canadian GST registration #125393314. Microfilm edition: University Microfilm, Ann Arbor MI 48106. POSTMASTER: Send address changes to 73 Amateur Radio Today, 70 Hancock Rd., Peterborough NH 03458-1107. 73 Amateur Radio Today is owned by Shabromat Way Ltd. of Hancock NH.



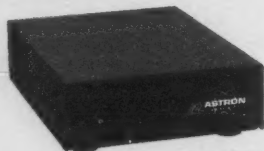
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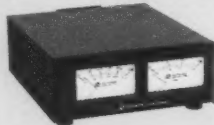
MODEL SS-10TK



MODEL SS-12IF



MODEL SS-18



MODEL SS-25M



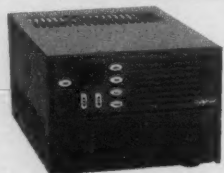
MODEL SRM-30



MODEL SRM-30M-2



MODEL SS-12SM/GTX



MODEL SS-10EFJ-98

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SS-12	10	12	1 1/2 x 6 x 9	3.4
SS-18	15	18	1 1/2 x 6 x 9	3.6
SS-25	20	25	2 1/4 x 7 x 9 1/2	4.2
SS-30	25	30	3 1/4 x 7 x 9 1/2	5.0

DESKTOP SWITCHING POWER SUPPLIES WITH VOLT AND AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SS-25M*	20	25	2 1/4 x 7 x 9 1/2	4.2
SS-30M*	25	30	3 1/4 x 7 x 9 1/2	5.0

RACKMOUNT SWITCHING POWER SUPPLIES

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25	20	25	3 1/2 x 19 x 9 1/2	6.5
SRM-30	25	30	3 1/2 x 19 x 9 1/2	7.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M	20	25	3 1/2 x 19 x 9 1/2	6.5
SRM-30M	25	30	3 1/2 x 19 x 9 1/2	7.0

2 ea SWITCHING POWER SUPPLIES ON ONE RACK PANEL

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25-2	20	25	3 1/2 x 19 x 9 1/2	10.5
SRM-30-2	25	30	3 1/2 x 19 x 9 1/2	11.0

WITH SEPARATE VOLT & AMP METERS

MODEL	CONT. (Amps)	ICS	SIZE (inches)	Wt.(lbs.)
SRM-25M-2	20	25	3 1/2 x 19 x 9 1/2	10.5
SRM-30M-2	25	30	3 1/2 x 19 x 9 1/2	11.0

CUSTOM POWER SUPPLIES FOR RADIOS BELOW

EF JOHNSON AVENGER GX-MC41
EF JOHNSON AVENGER GX-MC42
EF JOHNSON GT-ML81
EF JOHNSON GT-ML83
EF JOHNSON 9800 SERIES
GE MARC SERIES
GE MONOGRAM SERIES & MAXON SM-4000 SERIES
ICOM IC-F11020 & IC-F2020
KENWOOD TK760, 762, 840, 860, 940, 941
KENWOOD TK760H, 762H
MOTOROLA LOW POWER SM50, SM120, & GTX
MOTOROLA HIGH POWER SM50, SM120, & GTX
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
MOTOROLA RADIUS & GM 300
UNIDEN SMH1525, SMU4525
VERTEX — FTL-1011, FT-1011, FT-2011, FT-7011

NEW SWITCHING MODELS

SS-10GX, SS-12GX
SS-18GX
SS-12EFJ
SS-18EFJ
SS-10-EFJ-98, SS-12-EFJ-98, SS-18-EFJ-98
SS-12MC
SS-10MG, SS-12MG
SS-101F, SS-121F
SS-10TK
SS-12TK OR SS-18TK
SS-10SM/GTX
SS-10SM/GTX, SS-12SM/GTX, SS-18SM/GTX
SS-10RA
SS-12RA
SS-18RA
SS-10SMU, SS-12SMU, SS-18SMU
SS-10V, SS-12V, SS-18V

RAMSEY

Doppler Direction Finder

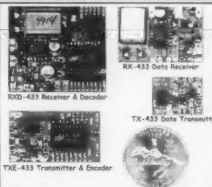
Track down jammers and hidden transmitters with ease! This is the famous WA2EBY DF'er featured in April 99 QST. Shows direct bearing to transmitter on compass style LED display, easy to hook up to any FM receiver. The transmitter - the object of your DF'ing - need not be FM, it can be AM, FM or CW. Easily connects to receiver's speaker jack and antenna, unit runs on 12 VDC. We even include 4 handy home-brew "mag mount" antennas and cable for quick set up and operation! Whips can be cut and optimized for any frequency from 130-1000 MHz. Track down that jammer, win that fox hunt, zero in on that downed Cessna - this is an easy to build, reliable kit that compares most favorably to commercial units costing upwards of \$1000.00! This is a neat kit!!

DDF-1, Doppler Direction Finder Kit \$149.95

Wireless RF Data Link Modules

RF link boards are perfect for any wireless control application; alarms, data transmission, electronic monitoring...you name it. Very stable SAW resonator transmitter, crystal controlled receiver - no frequency drift! Range up to 600 feet, license free 433 MHz band. Encoder/decoder units have 12 bit Holtek HT-12 series chips allowing multiple units all individually addressable, see web site for full details. Super small size - that's a quarter in the picture! Run on 3-12 VDC. Fully wired and tested, ready to go and easy to use!

RX-433 Data Receiver..... \$16.95 TX-433 Data Transmitter..... \$14.95
RXD-433 Receiver/Decoder..... \$21.95 TXE-433 Transmitter/Encoder..... \$19.95



World's Smallest TV Transmitters



We call them the 'Cubes'.... Perfect video transmission from a transmitter you can hide under a quarter and only as thick as a stack of four pennies - that's a nickel in the picture! Transmits color or B&W with fantastic quality - almost like a direct wired connection to any TV tuned to cable channel 59. Crystal controlled for no frequency

drift with performance that equals models that cost hundreds more! Basic 20 mW model transmits up to 300' while the high power 100 mW unit goes up to 1/4 mile. Their very light weight and size make them ideal for balloon and rocket launches, R/C models, robots - you name it! Units run on 9 volts and hook-up to most any CCD camera or standard video source. In fact, all of our cameras have been tested to mate perfectly with our Cubes and work great. Fully assembled - just hook-up power and you're on the air! One customer even put one on his dog!

C-2000, Basic Video Transmitter..... \$89.95 C-2001, High Power Video Transmitter..... \$179.95

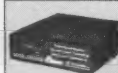
CCD Video Cameras



Top quality Japanese Class 'A' CCD array, over 440 line line resolution, not the off-spec arrays that are found on many other cameras. Don't be fooled by the cheap CMOS single chip cameras which have 1/2 the resolution, 1/4 the light sensitivity and draw over twice the current! The black & white models are also super IR (Infrared) sensitive. Add our invisible to the eye, IR-1 illuminator kit to see in the dark! Color camera has Auto gain, white balance, Back Light Compensation and DSI! Available with wide-angle (80°) or super slim Pin-hole style lens. Run on 9 VDC, standard 1 v-p-p video. Use our transmitters for wireless transmission to TV set, or add our IB-1 Interface board kit for super easy direct wire hook-up to any video monitor, VCR or TV with A/V input. Fully assembled, with pre-wired connector.

CCDWA-2, B&W CCD Camera, wide-angle lens \$69.95
CCDPH-2, B&W CCD Camera, slim fit pin-hole lens \$69.95
CCDCC-1, Color CCD Camera, wide-angle lens \$129.95
IR-1, IR Illuminator Kit for B&W cameras \$24.95
IB-1, Interface Board Kit \$14.95

AM Radio Transmitter



Operates in standard AM broadcast band. Pro version, AM-25, is synthesized for stable, no-drift frequency and is settable for high power output where regulations allow, typical range of 1-2 miles. Entry-level AM-1 is tunable, runs FCC maximum 100 mW, range 1/4 mile. Both accept line-level inputs from tape decks, CD players or mike mixers, run on 12 volts DC. Pro AM-25 includes AC power adapter, matching case and bottom loaded wire antenna. Entry-level AM-1 has an available matching case and knob set that dresses up the unit. Great sound, easy to build - you can be on the air in an evening!

AM-25, Professional AM Transmitter Kit \$129.95
AM-1, Entry level AM Radio Transmitter Kit \$29.95
CAM, Matching Case Set for AM-1 \$14.95

Mini Radio Receivers



Imagine the fun of tuning into aircraft a hundred miles away, the local police/fire department, ham operators, or how about Radio Moscow or the BBC in London? Now imagine doing this on a little radio you built yourself - in just an evening! These popular little receivers are the nuts for catching all the action on the local ham, aircraft, standard FM broadcast radio, shortwave or WWV National Time Standard radio bands. Pick the receiver of your choice, each easy to build, sensitive receiver has plenty of crystal clear audio to drive any speaker or earphone. Easy one evening assembly, run on 9 volt battery, all have squelch except for shortwave and FM broadcast receiver which has subcarrier output for hook-up to our SCA adapter. The SCA-1 will tune in commercial-free music and other 'hidden' special services when connected to FM receiver. Add our snazzy matching case and knob set for that smart finished look!

AR-1, Airband 108-136 MHz Kit \$29.95
HFRC-1, WWV 10 MHz (crystal controlled) Kit \$34.95
FR-1, FM Broadcast Band 88-108 MHz Kit \$24.95
SR-1, Shortwave 4-11 MHz Band Kit \$29.95
SCA-1 SCA Subcarrier Adapter kit for FM radio \$27.95
FR-6, 6 Meter FM Ham Band Kit \$34.95
FR-10, 10 Meter FM Ham Band Kit \$34.95
FR-146, 2 Meter FM Ham Band Kit \$34.95
FR-220, 220 MHz FM Ham Band Kit \$34.95
Matching Case Set (specify for which kit) \$14.95

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Easy to use programmer for the PIC16C84, 16F84, 16F83 microcontrollers by Microchip. All software - editor, assembler, run and program - as well as free updates available on Ramsey download site! This is the popular unit designed by Michael Covington and featured in Electronics Now, September 1998. Connects to your parallel port and includes the great looking matching case, knob set and AC power supply. Start programming those really neat microcontrollers now...order your PICPRO today!

PIC-1, PICPRO Pic Chip Programmer Kit \$59.95

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www.ramseyelectronics.com

1 GHz RF Signal Generator



A super price on a full featured RF signal generator! Covers 100 KHz to 999.99999 MHz in 10 Hz steps. Tons of features; calibrated AM and FM modulation, 90 front panel memories, built-in RS-232 interface, +10 to -130 dBm output and more! Fast and easy to use, its

big bright vacuum fluorescent display can be read from anywhere on the bench and the handy 'smart-knob' has great analog feel and is intelligently enabled when entering or changing parameters in any field - a real time saver! All functions can be continuously varied without the need for a shift or second function key. In short, this is the generator you'll want on your bench, you won't find a harder working RF signal generator - and you'll save almost \$3,000 over competitive units!

RSG-1000B RF Signal Generator \$1995.00

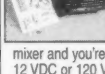
Super Pro FM Stereo Transmitter



Professional synthesized FM Stereo station in easy to use, handsome cabinet. Most radio stations require a whole equipment rack to hold all the features we've packed into the FM-100. Set freq with Up/Down buttons, big LED display. Input low pass filter gives great sound (no more squeals or swishing from cheap CD inputs) Limiters for max 'punch' in audio - without over mod, LED meters to easily set audio levels, built-in mixer with mike, line level inputs. Churches, drive-ins, schools, colleges find the FM-100 the answer to their transmitting needs, you will too. Great features, great price! Kit includes cabinet, whip antenna, 120 VAC supply. We also offer a high power export version of the FM-100 fully assembled with one watt of RF power, for miles of program coverage. The export version can only be shipped if accompanied by a signed statement that the unit will be exported.

FM-100, Pro FM Stereo Transmitter Kit \$249.95
FM-100WT, Fully Wired High Power FM-100 \$399.95

FM Stereo Radio Transmitters



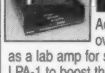
No drift, microprocessor synthesized! Great audio quality, connect to CD player, tape deck or mike mixer and you're on the air. Strappable for car or home use! Runs on 12 VDC or 120 VAC. Kit includes snazzy case, whip antenna, 120 VAC power adapter - easy one evening assembly.

FM-25, Synthesized Stereo Transmitter Kit \$129.95

Lower cost alternative to our high performance transmitters. Great value, easily tunable, fun to build. Manual goes into great detail about antennas, range and FCC rules. Handy for sending music thru house and yard, ideal for school projects too - you'll be amazed at the exceptional audio quality! Runs on 9V battery or 5 to 15 VDC. Add matching case and whip antenna set for nice 'pro' look.

FM-10A, Tunable FM Stereo Transmitter Kit \$34.95
CFM, Matching Case and Antenna Set \$14.95
FMAC, 12 Volt DC Wall Plug Adapter \$9.95

RF Power Booster



Add muscle to your signal, boost power up to 1 watt over a freq range of 100 KHz to over 1000 MHz! Use as a lab amp for signal generators, plus many foreign users employ the LPA-1 to boost the power of their FM transmitters, providing radio service through an entire town. Runs on 12 VDC. For a neat finished look, add the nice matching case set. Outdoor unit attaches right at the antenna for best signal - receiving or transmitting, weatherproof, too!

LPA-1, Power Booster Amplifier Kit \$39.95
CLPA, Matching Case Set for LPA-1 Kit \$14.95
LPA-1WT, Fully Wired LPA-1 with Case \$39.95
FMBA-1, Outdoor Mast Mount Version of LPA-1 \$59.95

FM Station Antennas

For maximum performance, a good antenna is needed. Choose our very popular dipole kit or the Comet, a factory made 5/8 wave coilinear model with 3.4 dB gain. Both work great with any FM receiver or transmitter.

TM-100, FM Antenna Kit \$39.95
FMA-200, Vertical Antenna \$114.95



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NEVER SAY DIE

Wayne Green W2NSD/1

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www.waynegreen.com

Anniversary

Sigh. If you're a relatively new reader, there's too much to tell for me to recap the 40 years since I started publishing 73. You can check out my been-there, done-that list on my Web site: [www.waynegreen.com]. If you've been reading 73 for a few years, you've already read about it. My goal now is to celebrate the 50th anniversary in 2010. I'm even making a good try for being around in 2060 to celebrate the 80th anniversary. That's if I can repair the damage I've done to my body through ignorance over the last 75 or so years. I'm working on it.

Of course, if amateur radio blows away, that would put an end to the publication.

Thus, I was sorely dismayed to read the minutes of the recent ARRL board meeting and see nothing whatever proposed by any board member or officer in the way of a major initiative to make the hobby better known.

I enjoy writing these editorials, and doing the research it takes to make sure I'm on firm ground, but I'm disappointed that my pleas for letters from you have gone unanswered.

I've asked you to write and tell me about some of your most exciting adventures that amateur radio has provided. These would not only interest our readers, but could be collected to make a great book to infect youngsters with the ham virus.

And if you haven't had any ham radio adventures worth writing about, why the heck not? What's the deal? What's the matter with you? Heck, by the way, I believe, is a small,

not quite as harsh, subdivision of hell.

What does it take to get you to start thinking about (a) how amateur radio can be improved; (b) how 73 can be improved (and never mind any crummy wisecracks about cutting back my editorial — they tried that a few years ago and lost 60% of our subscribers); (c) how we can attract more youngsters into the hobby?

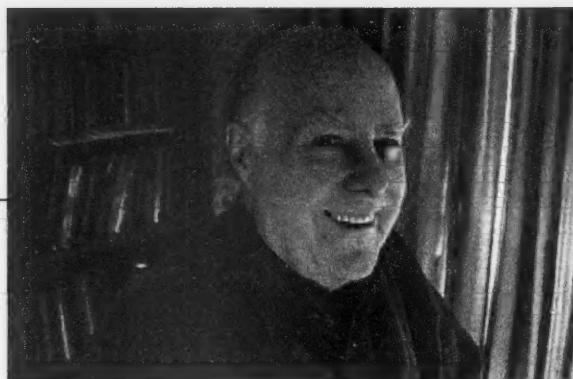
If that doesn't get your word processor going, (d) how about a letter or a piece telling us how amateur radio has changed your life; (e) what's the most fun you've had in the hobby; (f) has amateur radio provided you with any adventure?

Jeesh, I've hammed from a balloon over the South African veldt, from a C-54 flying around the world, from the Korean DMZ, from the famed American Embassy in Tehran, while skiing in Aspen, and from many commercial planes while flying across the country (with the pilot's permission). How about working my home station on 75m from Australia! And working Moscow by ham satellite!

Now, get busy and bury me with letters. The best I'll put together into a propaganda booklet ham clubs can use to snooker kids into joining our fun. Yes, I'd appreciate a disk copy. Oh, heck, you can (gulp!) E-mail 'em to me at w2nsd@aol.com. Just what I need — more E-mail. Not.

New Novice?

Jim McCarthy WN4GMT called to order some of my books. When he upgraded, he opted for his original Novice call ... and got it back! I'll



bet he'll fake a lot of us out with that one! Good going, there, Jim.

They're Lying

About what? The more I learn, the more I see they're lying about almost everything. They're lying about health, education, drugs, our money, taxes, and on down the list.

Bore is lying (big surprise). About what? About his proposed spending plans to provide more money for our schools, for instance. About our needing smaller classes and more teachers. This is the mantra of the NEA, the teachers' union, which seems to have learned a lot from the railroad union about feather-bedding.

Congress, ever ready to spend our tax money, has budgeted \$1.3 billion for class size reduction in the Elementary and Secondary Education Act of 2000.

Class size has been shrinking for the last 30 years, down from 22.3 students per teacher in 1970 to today's average of 17. So what's the result? Lower SATs, lower scores compared to students in other countries, and far lower scores compared to 30 years ago. There have been no detectable benefits from the smaller classes.

What does influence student's reading scores? At least one educated parent, family income, the availability of books in the home, and inversely, the time a kid spends watching TV. Race is a big factor, but class size has not had any noticeable effect.

When I went to public school in Brooklyn we had more than 30 students per teacher, and we learned to read circles around today's kids.

Well, how about computers? Bore wants to have every classroom and school library connected to the information superhighway. Little of the stuff they access on the Internet is educational. It's just another way to spend a lot of time having fun — or learning how to hack Defense Department computer systems. There are no studies showing any benefits for kids derived from accessing the Internet.

In the beginning I had hopes that computers would be used for helping kids access information. Indeed, I donated a bunch of computers to two of our local schools to help the kids become computer literate. I wasted my money and their time.

Halving School Costs

Actually, I think we'll be able to cut them by more like 90%, not just 50%. Heck, the Sudbury Valley School costs half as much to operate as the public schools in Massachusetts, and the graduates are far better educated. Far, far better. They even are able to think for themselves, instead of having their initiative, creativity, motivation, and perseverance stunted for life.

Hmm, let's see. About how many teachers do we have? Well, if we have 58 million students and 22 students average in classes, that's around

Continued on page 8

Big Savings on Radio Scanners

COMMUNICATIONS ELECTRONICS INC.

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DISTRIBUTOR'S COUPON EXPIRES 10/30/96 #000675M

SAVE \$30 on MPV32 or RH256N

Save \$30 when you purchase your RELM MPV32 or RH256N transceiver directly from Communications Electronics Inc., PO Box 1045, Ann Arbor MI 48106 USA. Telephone orders accepted. Call 1-800-USA-SCAN. Mention offer CEI2. TERMS: Good only in USA & Canada. Only one coupon is redeemable per purchase and only on specified product.

NEW/RELM®MPV32-A Transceiver

Mfg. suggested list price \$515.00/Special \$299.95

Looking for a great hand-held two-way transceiver? Fire departments depend on the RELM MPV32 transceiver for direct two-way communications with their fire or police department, civil defense agency or ham radio repeater. The MPV32 is our most popular programmable frequency agile five watt, 32 channel handheld transceiver that has built-in CTCSS. This feature may be programmed for any 50 standard EIA tones. Frequency range 136.000 to 174.000 MHz. The full function, DTMF compatible keypad also allows for DTMF Encode/Decode and programmable ANI. Weighing only 15.5 oz., it features programmable synthesized frequencies either simplex or half duplex in 2.5 KHz. increments. Other features include PC programming and cloning capabilities, scan list, priority channel, selectable scan delay, selectable 5 watt/1 watt power levels, liquid crystal display, time-out timer and much more. When you order the MPV32 from CEI, you'll get a complete package deal including antenna, 700 ma battery (add \$20.00 to substitute a 1000 ma battery), battery charger, belt clip and user operating instructions. Other useful accessories are available. A heavy duty leather carrying case with swivel belt loop part #LCMP is \$49.95; rapid charge battery charger, part #BCMP is \$69.95; speaker/microphone, part #SMMP is \$54.95; extra high capacity 1000 ma. ni-cad battery pack, part #BPMP1 is \$79.95; extra 700 ma. ni-cad battery pack, part #BPMP2 is \$59.95; cloning cable, part #CCMP is \$34.95; PC programming kit, part #PCKIT030 is \$224.95. A UHF version with a frequency range of 450-480 MHz, part #MPU32 is on special for \$299.95. Your RELM radio transceiver is ideal for many different applications since it can be programmed with just a screwdriver and programming instructions in less than 10 minutes. Programming is even faster with the optional PC kit. The programming instructions part #PIMPV is \$19.00. Call 1-800-USA-SCAN to order for RELM radios.

Bearcat®895XLT-A1 Radio Scanner
Mfg. suggested list price \$729.95/Special \$194.95
300 Channels • 10 banks • Built-in CTCSS • S Meter
Size: 10-1/2" Wide x 7-1/2" Deep x 3-3/8" High
Frequency Coverage: 29,000-54,000 MHz., 108,000-174 MHz., 216,000-512,000 MHz., 806,000-823,995 MHz., 849,012-868,995 MHz., 894,012-956,000 MHz.

The Bearcat 895XLT is superb for intercepting trunked communications transmissions with features like TurboScan™ to search VHF channels at 100 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a Signal Strength Meter, RS232C Port to allow computer control of your scanner via optional hardware and 30 trunking channel indicator annunciators to show you real-time trunking activity for an entire trunking system. Other features include Auto Store - Automatically stores all active frequencies within the specified bank(s). Auto Recording - This feature lets you record channel activity from the scanner onto a tape recorder. CTCSS Tone Board (Continuous Tone Control Squelch System) which allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning enjoyment, order the following optional accessories: PS001 Cigarette lighter power cord \$14.95; PS002 DC power cord - enables permanent operation from your vehicle's fuse box \$14.95; MB001 Mobile mounting bracket \$14.95; EX711 External speaker with mounting bracket & ten feet of cable with plug attached \$19.95. The BC895XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden factory warranty. Not compatible with AGEIS, ASTRO, EDACS, ESAS or LTR systems. Call 1-800-USA-SCAN.

TrunkTracking Radio

DISTRIBUTOR'S COUPON EXPIRES 10/30/96 #000772

SAVE \$75 on one BC245XLT

Save \$75 when you purchase your Bearcat 245XLT handheld scanner directly from Communications Electronics Inc., PO Box 1045, Ann Arbor MI 48106 USA. Telephone orders accepted. Call 1-800-USA-SCAN. Mention offer CEI2. TERMS: Good only in USA & Canada. Only one coupon is redeemable per purchase and only on specified product.

Bearcat®245XLT-A TrunkTracker

Mfg. suggested list price \$429.95/CEI price \$269.95

300 Channels • 10 banks • Trunk Scan and Scan Lists

Trunk Lockout • Trunk Delay • Cloning Capability

10 Priority Channels • Programmed Service Search

Size: 2-1/2" Wide x 1-3/4" Deep x 6" High

Frequency Coverage: 29,000-54,000 MHz., 108-174 MHz., 406-512 MHz., 806-823,995 MHz., 849,012-868,995 MHz., 894,012-956,000 MHz.

Our new Bearcat TrunkTracker BC245XLT, is the world's first scanner designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS and EDACS analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. Our scanner offers many new benefits such as Multi-Track - Track more than one trunking system at a time and scan conventional and trunked systems at the same time. 300 Channels - Program one frequency into each channel. 12 Bands, 10 Banks - Includes 12 bands, with Aircraft and 800 MHz. 10 banks with 30 channels each are useful for storing similar frequencies to maintain faster scanning cycles or for storing all the frequencies of a trunked system. Smart Scanner - Automatically program your BC245XLT with all the frequencies and trunking talk groups for your local area by accessing the Bearcat national database with your PC. If you do not have a PC simply use an external modem. Turbo Search - Increases the search speed to 300 steps per second when monitoring frequency bands with 5 KHz. steps. 10 Priority Channels - You can assign one priority channel in any bank. Assigning a priority channel allows you to keep track of activity on your most important channels while monitoring other channels for transmissions. Preprogrammed Service (SVC) Search - Allows you to toggle through preprogrammed police, fire/emergency, railroad, aircraft, marine, and weather frequencies. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in your scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - An LCD light remains on for 15 seconds when the back light key is pressed. Autolight - Automatically turns the backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BC245XLT automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BC245XLT also works as a conventional scanner. Now it's easy to continuously monitor many radio conversations even though the message is switching frequencies. The BC245XLT comes with AC adapter, one rechargeable long life ni-cad battery pack, belt clip, flexible rubber antenna, earphone, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, ESAS or LTR systems. Hear more action on your radio scanner today. Call CEI today at 1-800-USA-SCAN to order your BC245XLT radio scanner.

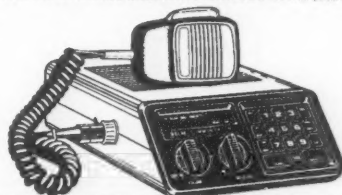
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RELM®RH256N-A Transceiver/SPECIAL

Mfg. suggested list price \$460.00/Special \$284.95

Size: 6-1/2" Wide x 10-3/4" Deep x 2-3/4" High

Frequency Coverage: 144,000-174,000 MHz.

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but not on 20 or 75 meters. The 12-, 15-, 17-, and 30-meter bands either did not exist or were not yet "authorized" for amateur use. Forty meters was a CW-only band at that time.

One full year of operation on CW was required before taking the Class A exam, which Jim passed in order to receive his Class A ticket, allowing AM phone operation on the 20 and 75 meter bands. SSSC—Single-Sideband Suppressed Carrier as it was called then—was only used by experimental stations and didn't come along for hams until much later. Still later, it was shortened to SSB.

an avocation and a career, plus a whole adult lifetime of enjoyment. Who could ask for more?"

Jim was employed as advertising manager for 73 from July 1980 until December 1985 (later working for *Popular Communications* for four years before retiring), and began his propagation forecast column in 1984, succeeding the late John Nelson. At the time, we felt that we would find no replacement able to duplicate Nelson's incredible accuracy, but W1XU eventually proved us wrong year after year.

Jim married his lovely wife Peg in 1953, and they have two children: Linda and Jim II. No matter where they lived, in New Hampshire or Arizona or wherever,

against the sky. Jim had pilot's eyes, that's for sure. What an interesting guy!"

I too once had the experience of flying RC gliders with Jim.

"Go ahead," he said. "Just take the controls, keep the nose up, sniff for the air."

Like Jeff, I could barely see the plane, but I did manage to keep it aloft for a minute or two.

"Go down to the end of the football field, there's an embankment there and we'll get some lift," Jim advised.

That I did, and by now I *thought* I could see the glider, but wasn't sure. Then it seemed to stop responding to my commands. Uh-oh, I thought.

Then Jim took the controls, and got the craft caught up in some gusts or shear or some such. He then (uncharacteristically) managed to crash it onto the roof of a warehouse. "Not to worry," he said. So I didn't. We eventually retrieved the pieces, but I was in the process of learning that the "not to worry" attitude was just one manifestation of Jim's great inner strength.

As his many QSLs attest, Jim operated CW, AM, and SSB telephony, RTTY, AMTOR, and other digital modes, and also explored the LF, HF, and VHF bands. His favorites, though, as he recently told me, were high-speed CW and 17m SSB. Another big pastime of Jim's, his secret love, was antenna experimentation.

During the Hurricane Agnes flood of 1973, W1XU operated his station for emergency traffic, and at other times he provided phone patches for stations at sea; during the Valdez, Alaska, earthquake; and for an isolated arctic ice island outpost station.

As Jim once said, "Ham radio has provided

Jim and Peggy were known not just as gracious hosts, but also as warm and caring human beings. Their house and activities were always open to friend and newcomer alike, all of whom were always quickly made to feel right at home.

One other love of Jim's was flying radio-controlled gliders. Jeff DeTray NK1F, former 73 assistant publisher, recently recalled: "I visited his house in Peterborough a couple of times for ham radio activities, and I joined him once at the high school to watch him fly radio-controlled sailplanes. At one point, he handed me the controls and told me to take over. I couldn't even tell which way the aircraft was pointed! To me, it was just a teensy spec

"Er... Jim, I think I just flew it out of range."

"Not to worry," said my dauntless advisor. "We'll just wait for it to blow back."

Which it did, amazingly. Then Jim took the controls, and got the craft caught up in some gusts or shear or some such. He then (uncharacteristically) managed to crash it onto the roof of a warehouse.

"Not to worry," he said. So I didn't. We eventually retrieved the pieces, but I was in the process of learning that the "not to worry" attitude was just one manifestation of Jim's great inner strength.

Jim died of cancer, without pain, and with quite a number of months to prepare. He just felt uncomfortable all over, he told me. Problem was, he chuckled, every time he tried to describe his condition to Peg, she kept trying to tell him that it sounded like he was pregnant. They were like that together.

He was very happy to have made it through early June, not just for having reached his 73rd birthday — 73 — but because his family was able to celebrate his son's marriage that same weekend. "There was a lot of love in that room," Jim was happy to report.

Before closing, we should use this same space to celebrate the first propagation column by Jim's successor — his son, Jim II. We extend a warm welcome to Jim, knowing that he has been taught well. He lives in Arizona during the winter, and Juneau, Alaska, during the summer. There — guess what? — he's a pilot for Wings of Alaska.

While he was sick, I gave Jim the option of saying something in print to all his friends the world over, regardless of whether he wanted to mention his illness. "I'll leave that up to you," he said. "But I hope you will tell them, all of them, from on the air and off, that it's been a joy, and that I never, ever, will forget them."

"Sounds like you're at peace," I said.

"Who wouldn't be?" Jim laughed. "I've filed my final flight plan in God's hands." — Jack Burnett



Photo A. W1XU/7 doing what he loved best.

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New MFJ-259B reads antenna SWR . . . Complex RF Impedance: Resistance(R) and Reactance(X) or Magnitude(Z) and Phase(degrees) . . . Coax cable loss(dB) . . . Coax cable length and Distance to fault . . . Return Loss . . . Reflection Coefficient . . . Inductance . . . Capacitance . . . Battery Voltage. LCD digital readout . . . covers 1.8-170 MHz . . . built-in frequency counter . . . side-by-side meters . . . Ni-Cad charger circuit . . . battery saver . . . low battery warning . . . smooth reduction drive tuning . . . and much more!

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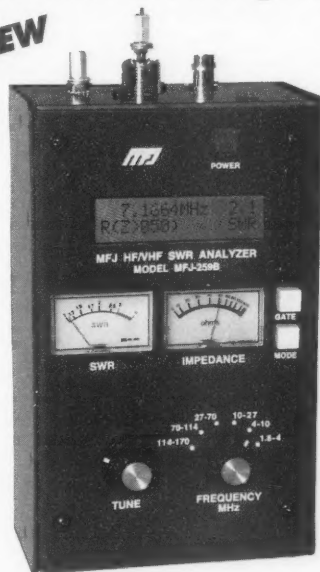
Accurately measure distance to a short or open in a failed coax. Measure length of a roll of coax, coax loss, velocity factor and impedance.

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NEUER SAY DIE

continued from page 4

2.5 million teachers. Plus around 2.5 million administrators. Now what can our businesses do to assimilate five million poorly educated, often unmotivated workers if we eliminate the need for teachers almost entirely?

With the average K-12 school costing us about \$6,000 per student, and there being four terms a year, that's \$1,500 per term. Let's see, we have a five hour school day, so they're taking a maximum of five subjects per term. That's \$300 per subject.

Now let's suppose that we replace the teacher with a DVD using Hollywood production techniques, star performers, top-notch script writers, and state-of-the-art graphics, making every subject so much fun that kids will be excited about learning. Like movie DVDs, the studio could make a good profit selling them for \$30, and that would include plenty of promotion and advertising in the budget.

That's 10% the cost of teachers who often don't know the subject they're teaching, and who mostly have to depend on the students reading the textbook.

You can see where a 90% cost reduction would be easy. Maybe more like 95%, when there's good, solid competition from several producers.

In addition to covering everything that our schools are supposed to be teaching, there will be a market for courses that should be taught, plus others that kids will want to learn about. And these courses, or programs, will cover high school, college, graduate material, plus business courses.

Working parent families will need schools like Sudbury Valley as baby-sitters while they're working.

Kids, when not dumbed down by our present school system, have an incredible thirst to learn. We just need to pave the way for them.

Bore Promo

The Bore and Gush cam-

paigns are in full swing. I did enjoy the Clinton-Bore organizing of the Million Mom March against guns. This was organized by Donna Thomas, a CBS publicist who works for David Letterman, and is Hillary's closest friend, political strategist, and, frequently, attorney of record — like during the Whitewater scandal. She also helped scare off the women in Arkansas who might sue or squeal on Clinton.

Children and guns. Great political issue, and never mind that children's deaths by guns have gone down 30% in the last decade. The Clinton (Bore) administration claims that 13 children die every day from guns. They don't mention that fewer than 3% are children under 10, and that 70% are teenagers killed in gang fights.

It's all just the usual media hype foofaraw. I hope you didn't get suckered into taking it seriously.

More Bore

Our choice of Bore or Gush

this year is, to me, a clear demonstration of how far we've let our politicians mess up our country. Please don't try to tell me that these two turkeys are the very best potential presidential candidates we have.

We're grumbling about the high gas prices, right? So we have Bore, in his *Earth in the Balance* book, advocating higher fuel prices. And we have Gush, the oil man, smiling broadly as the gas pumps ding away our bucks.

What we don't have is any constituency for the public investigating the situation and exposing what's really going on. The one thing we do know for sure — we're not being told the truth. Truth and government just don't seem comfortable together.

I don't know how many gigabucks of our taxes are going into the Energy Department black hole, but we might all be able to have an extra vacation if its panjandruns and

Continued on page 61

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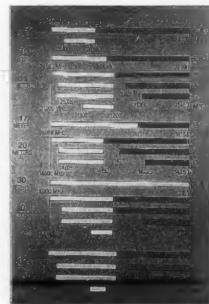
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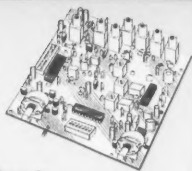


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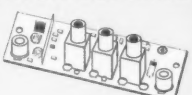
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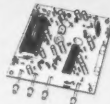
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With Fingers Crossed

The latest on Phase 3-D.

With a bit of luck and a trailing wind, this month should see the long-awaited launch of amateur radio's newest satellite on an Ariane-5 rocket. Here, Richard Limebear G3RWL, FBIS [that's Fellow of the British Interplanetary Society — ed.], tells all about the Phase 3-D amateur radio satellite.

The new spacecraft, currently known as Phase 3-D, will receive the next OSCAR number in the series once it achieves orbit and is proved to be working. Watch the amateur radio media for an announcement of the launch; useful places to watch would be *73* and *Radio Today*; or, for faster news, the RSGB and AMSAT Web sites at [www.rsgb.org] and [www.amsat.org]; news on the packet radio network; AMSAT nets; etc. This article will try to tell you what to expect from amateur radio's newest venture. For in-depth information about using amateur radio satellites, the reader is referred to the Satellite chapter in the latest *Radio Communication Handbook*,¹ but I'll try to keep the use of jargon to a minimum.

The foremost thing to be aware of is that it won't be available for everyone to use immediately after launch. Once orbit is achieved, it will then be up to the command stations to check it out, and then they'll make some changes to

the orbit before we, the users, are let loose on it; this will take a few months.

The Ariane-5 flight puts us into what is known as a Geostationary Transfer Orbit; this elliptical orbit has its perigee (the lowest part of the orbit) at about 590 km, apogee (the highest part of the orbit) at about 39,000 km, and an inclination of only about 10°. Phase 3-D's ultimate orbit is different from this, so, once we are delivered into space, it's up to us to move into another orbit plane. Phase 3-D (commonly called P3D) carries its own propulsion in order to make the changes — but these will not happen fast.

The orbit-change philosophy has changed from the previously expected scenario, whereby P3D would fire the main engine a couple of times and then drift for a year or two before a final firing. This is due to Viktor Kudielka OE1VKW, who made a very detailed mathematical analysis of orbital conditions for the best way to reach the final orbit. The good news is that we will reach the final stable orbit after about 10 months, instead of two years as previously expected.

After launch, the ARCJET motor will be used for about 270 days to raise the apogee up to somewhere between

60,000 and 75,000 km, and we will then let the orbit drift while natural forces take effect and change the Argument of Perigee. Within this period, there will be at least 120 days of transponder operation for the users, perhaps more, depending on how long the batteries take to recharge after the ARCJET burns.

Another month will then be needed for various maneuvers using the main 400N motor, i.e., raising inclination to 63.4° and reducing the apogee height for a 16h orbit, fine tuning of the orbit, etc. Then the spin will be stopped and P3D turned into three-axis orientation, followed by deployment of the solar arrays.



Photo A. P3D patch.

Reproduced from the August 1999 issue of *Radio Today*, with permission of the copyright holder, the Radio Society of Great Britain.

The above, in particular the 75,000 km apogee, may sound strange to some people, but it's only temporary and is needed for the best efficiency of the maneuvers to reach the stable final orbit.

The final orbit will be tuned to synchronize the period of the orbit with the length of the day, and result in the satellite making exactly three orbits in two days. Every second day the satellite is intended to be in the same part of the sky, in order to make the tracking easier.

The theory goes like this: The average satellite user spends eight hours per day working, eight hours sleeping, and eight hours in leisure activities. Conveniently, the areas of the world with the most amateur radio operators (Europe, America, and Asia) are separated by about eight hours in terms of time zones (or 120° of latitude).

So AMSAT will be aiming for a final orbit that puts P3D into peoples' skies at the time when they will be at leisure. With this orbit, depending on when you look, it will be possible to work almost the whole world (with the exception of a small circle around the antipodal point), but you can work everywhere else if you pick the right time.

Now, what do we have to do to make QSOs? Do we need several kilowatts and a 90-ft. dish in the garden? No. We shouldn't expect to work P3D with a handheld, but 50 W and small beams, preferably with a receive preamplifier, should be OK most of the time — it is designed for the average user, not the kilowatt gang. But P3D has a lot of microwave equipment aboard and, while traditional 2m and 70cm users will be catered for, we expect to make much more usage of the higher bands up to 24 GHz. There has never been so much equipment available for easy use of microwaves — check it out. I'm mainly a CW operator with an HF background and scared of the higher technology ... but even I am planning to use 1260 and 2400 MHz!

Tracking

First of all we need to know about P3D's orbit, the main questions being, "Where do I point my antenna, and when?"

Satellites move, so if we want to use them we need to know where to point the beams ... and when. Orbital data (called Keplerian elements or more

commonly Keplers) is published and used by computer software that is readily available from various sources, including the various AMSAT organizations. This certainly takes the slog out of predicting where the satellite will be at any given time.

Once P3D's final orbit has been achieved, it should be theoretically possible to nail a beam into one position and see the same satellite window every second day for several hours.

In the meantime, however, and for the greatest DX opportunities, we need to move the beam around. But satellite signals don't just come from out on the horizon. P3D will sometimes be overhead, so it is beneficial to be able to point the antennas upwards to varying extents (the jargon phrase is *elevation*) as well as use the traditional compass (azimuth) directions. Without some means of elevation, there will be times when P3D is out of an ordinary antenna's beamwidth.

However, the best DX will often occur with the beam pointing within 10° of the horizon, so don't let the lack of upward-pointing put you off; you can always add it later if the bug really bites.

Equipment

Simple beams, medium power, and a fairly sensitive receive setup

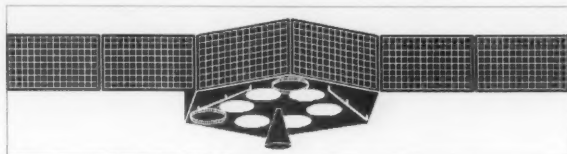


Photo B. Line drawing of P3D.

are the order of the day. Transmitters on 2m and 70cm will need to put about 50 W into the antenna system. But P3D has microwave equipment as well; here, lower powers combined with higher gain antennas will be usable. The bottom line will generally be that 50 to 100 W ERP, once antenna gain and feeder loss has been taken into account, is what's required.

Antennas need not be gigantic, but don't expect too much from ground planes. A minimum requirement for everyday use would be roughly six elements on 2m and 10 elements on 70cm. Of course, on the higher bands we can get quite a lot of gain from fairly small

Continued on page 12

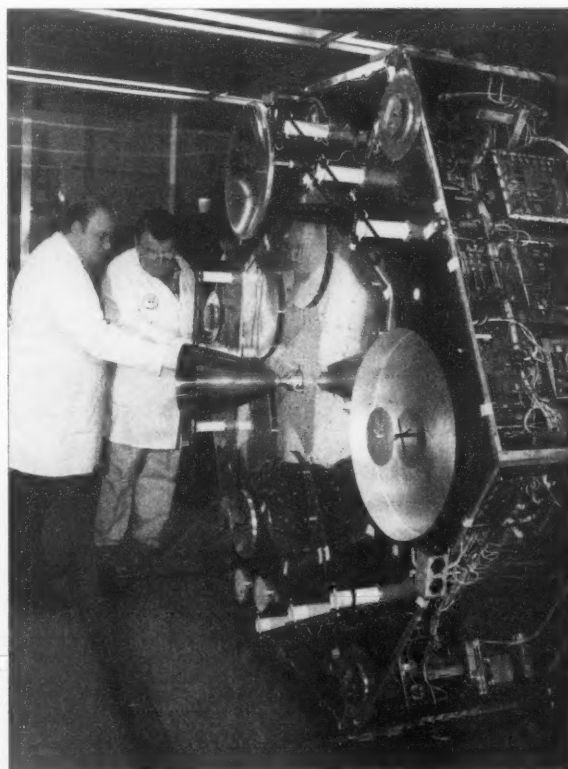


Photo C. Our baby is nearly finished. Peter Gülzow DB2OS (left) and Werner Haas DJ5KQ in the labs at Orlando. (G3RUH photo)

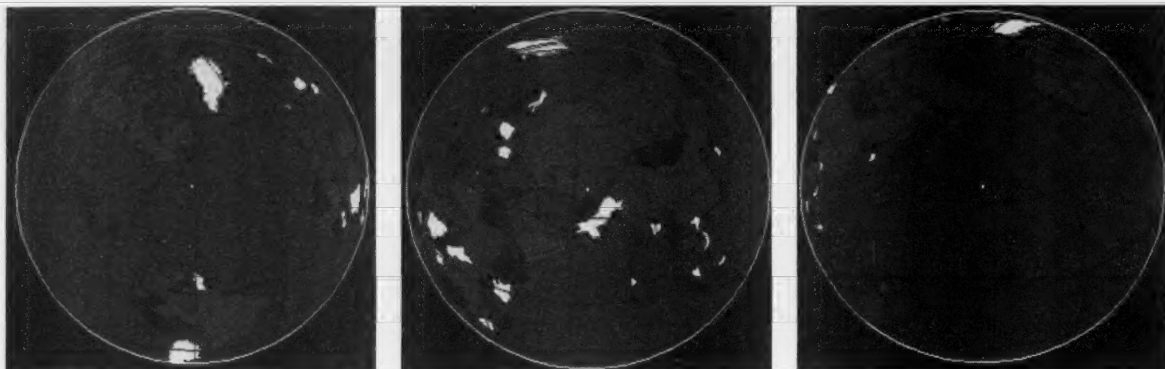


Photo D. Three apogees: over Atlantic, Europe, and Pacific. This is what P3D will be able to see from the top of its orbit. These images are screen-grabs from the AMSAT tracking program InstantTrack.

Uplink Frequencies			
Band	Band Letter	Digital Passband (MHz)	Analog Passband (MHz)
15m		none	21.210–21.250
12m		none	24.920–24.960
2m	V	145.800–145.840	145.840–145.990
70cm	U	435.300–435.550	435.550–435.800
23cm(1)	L	1269.000–1269.250	1269.250–1269.500
23cm(2)	L	1268.075–1268.325	1268.325–1268.575
13cm(1)	S	2400.100–2400.350	2400.350–2400.600
13cm(2)	S	2446.200–2446.450	2446.450–2446.700
6cm	C	5668.300–5668.550	5668.550–5668.800
Downlink Frequencies			
2m	V	same as analog	145.800–145.990
70cm	U	435.900–436.200	435.475–435.725
13cm(1)	S	2400.650–2400.950	2400.225–2400.475
13cm(2)	S	2401.650–2401.950	2401.225–2401.475
3cm	X	10451.450–10451.750	10451.025–10451.275
1.5cm	Ka	24048.450–24048.750	24048.025–24048.275
All receivers are inverting. Telemetry beacons are for command purposes and are modulated in 400 bit/s BPSK, AMSAT format.			
Telemetry Beacons (IHU)			
Band	General Beacon (GB) (MHz)	Middle Beacon (MB) (MHz)	Engineering Beacon (EB) (MHz)
2m	none	145.880	none
70cm	435.450	435.600	435.850
13cm(1)	2400.200	2400.350	2400.600
13cm(2)	2401.200	2401.350	2401.600
3cm	10451.000	10451.150	10451.400
1.5cm	24048.000	24048.150	24048.400
<p>Middle Beacon (MB)</p> <p>IHU-2 OFF: MB carries normal IHU-1 400 PSK telemetry.</p> <p>IHU-2 ON: MB carries IHU-2 400 PSK telemetry. However, IHU-2 can also monitor the IHU-1 telemetry stream, and retransmit that if required.</p>			

Table 1. P3D's uplink and downlink frequencies, telemetry beacons.

With Fingers Crossed

continued from page 11

dish antennas, so there will be no need to fill the garden with aluminum.

Reception is the most critical part of working any satellite. P3D carries beams and dishes, but there will be times when they aren't pointing directly at us. A receive preamplifier, while not mandatory, could make the difference between working the satellite and hearing nothing. Penny for penny, the best investment in any satellite station is in reducing feedline losses and improving reception. Don't expect the signals to push the S-meter off the scale; the usual target is to get the beacon at about S6.

Recommended operating modes for the analog parts of P3D are CW and SSB — FM is not very friendly to the onboard power budget, so please do not use this mode on P3D.

Operations

Satellite operation is generally full duplex; we listen to our own signals coming back from space, and this is facilitated by having the transmit and receive links (called uplink and downlink) on different frequency bands. **Table 1** shows P3D's uplink and downlink frequencies. Note, though, that not all the transmitters and receivers will be switched through all of the time. Apart from the problem of transmitting and receiving on the same band, which will desensitize the receiver, the available power is not sufficient to have everything switched on at once, so operations will run to a timetable. **Fig. 1** shows the matrix control screen.



So, a 435 MHz receiver connected to a 145 MHz transmitter (which was "mode B") will be called mode UV, and a 1.2 GHz receiver connected to a 2.4 GHz transmitter will be called

mode LS, etc. The first letter(s) denote(s) the uplink. The old nomenclature had to be changed because there are so many combinations possible with P3D's connection matrix, including multiple receivers connected to multiple transmitters. See Table 2.

This hardware lineup means we will have a very versatile digital package that, in addition to traditional modes, will be software-configurable for any modulation method that may appear during the satellite's lifetime. The opportunity is also there for people to write software for the modems — we need volunteers to work on this — but DSP experience is a must. The satellite will have up to 250 watts PEP output, or about 60 watts continuous. Of that 60 W, the digital equipment will have

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21 MHz	T
24 MHz	H
145 MHz	V
435 MHz	U
1.2 GHz	L
2.4 GHz	S
5.6 GHz	C
10 GHz	X
24 GHz	K

Table 2. New band designations.

about 20 watts allocated to it. Of course, there ain't no such thing as a free lunch. Every digital downlink will need its own slice of the RF power available, so it is unlikely that the full digital capability will be exploited because we want to keep the downlink signals strong enough on the ground. Since P3D is much farther away than a low Earth orbit (LEO) satellite, the path loss is also much greater. The increased path loss, in fact, just about wipes out the advantage of the higher power, so digital users should expect signal strengths similar to current LEO digital satellites.

BBS operation will use the regular PacSat protocols as currently used on

other 9600 bps satellites, but with more memory, more file system entries, and more files kept on board. Users of current digital satellites should be able to work P3D with their existing equipment. We currently have no specific plans for the 153 kbps equipment; possible applications are international wormholes and packet forwarding.

In addition to digital operations, Rudak's processor unit acts as the interface for several onboard experiments. It can also listen to the main beacon output and process that data, probably making it available as files to download from the BBS. But this is just one module on a fairly busy spacecraft, and it is likely that commissioning of Rudak will not occur until some time after launch.

Other payloads

A block diagram showing the complexity of P3D is given in Fig. 2. In addition to the communication and support equipment, P3D carries some other experiments: cameras, radiation and spectrum monitoring, a new type of computer, and GPS.

The SCOPE unit (Spacecraft Camera for Observation of Planets and Earth) will transmit color pictures to

Earth taken with two cameras. One delivers wide-angle pictures of the Earth and sky, and the other has a telescopic lens for pictures with more detail. This module was built by the Japanese AMSAT organization. The digital pictures will probably be compressed using the JPEG technique and stored in Rudak for later downloading. Users may later be given the chance to communicate directly with the experiment to take pictures on demand.

A second camera unit is carried as a technology demonstrator for future experiments. It is not intended to, nor can it, compete with the SCOPE experiment. This will produce black and white images with a slightly wider field of view than the SCOPE narrow-angle camera. Later, it might be used as a navigation instrument for Earth or star sensing.

The CEDEX (Cosmic-ray Energy Deposition Experiment) unit examines radiation in space and comes from the UoSat Group at the University of Surrey. It consists of two parts, a Total Dose Experiment (TDE) and a Cosmic Particle Experiment (CPE), which are designed for the varying regions of the orbit. The TDE picks up the total

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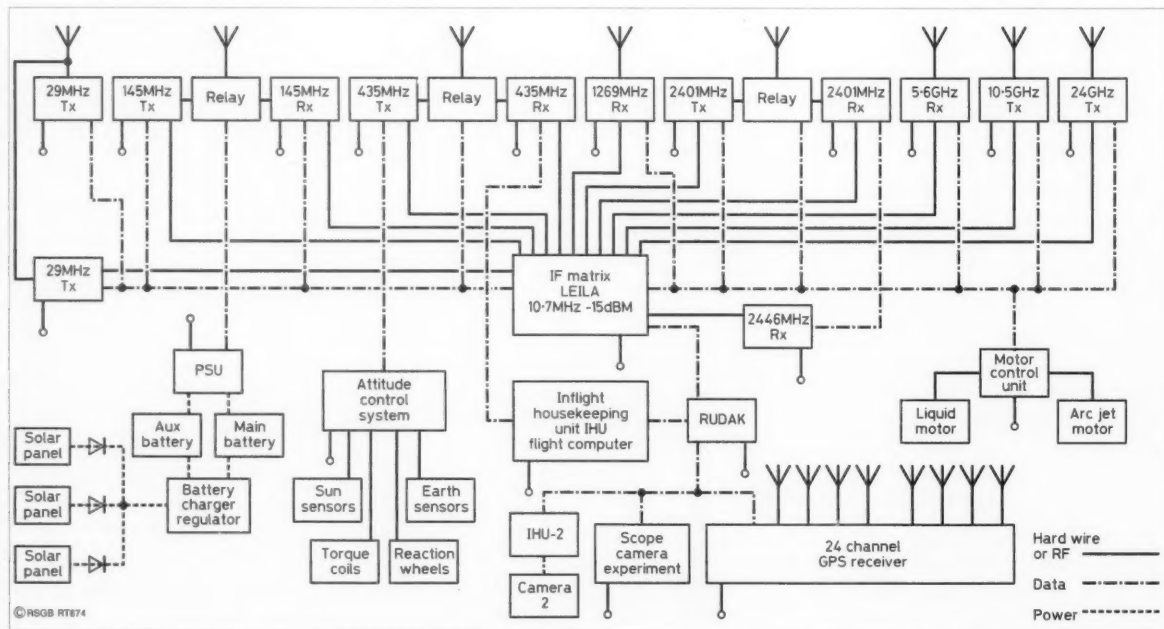


Fig. 2. Block diagram of the Phase 3-D spacecraft.

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Built-in 0-25 VDC voltmeter. Six feet super heavy duty eight gauge color-coded cable with ring tongue terminals. Binding posts are spaced for standard dual banana plugs. Heavy duty aluminum construction. 12 1/2" Wx2 1/2" Hx2 1/2" D in.

MFJ-1116, \$49.95. Similar to MFJ-

1118. No 30 amp posts. Has "ON" LED and 0-25 VDC voltmeter. 15 amps total.

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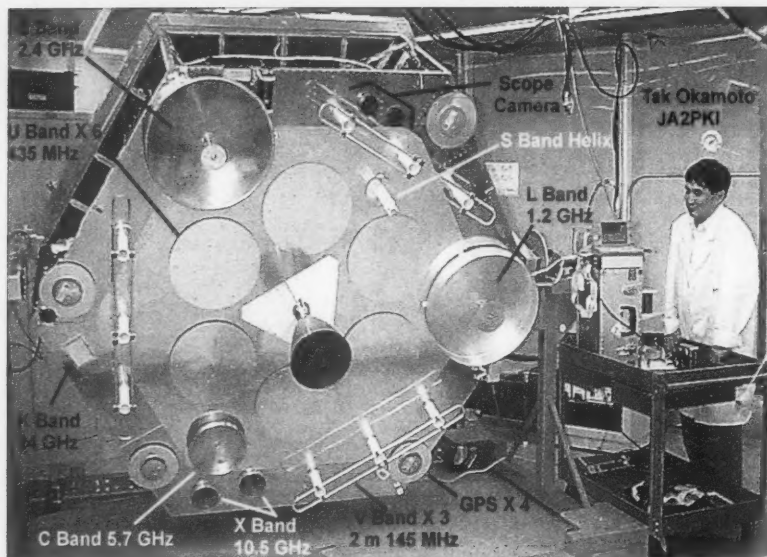


Photo E. Annotated image from the P3D Lab Web pages.

With Fingers Crossed

continued from page 14

accumulated doses of ionized radiation inside the satellite. The CPE should measure the effect of particle radiation inside the satellite while close to Earth on its Molniya orbit. These measurements are also interesting in examining radiation effects on the satellite's electronics.

The MONITOR experiment scans the shortwave spectrum from 0.5 to 30 MHz, but there is not much extra information about what this data will be used for.

The experimental AMSAT flight computer technology demonstrator, IHU-2, is an Intel SA-1100 CPU clocked at 133 MHz. This system supports a three-axis accelerometer, microphone, DSP modem, and the black-and-white CMOS camera previously mentioned. Camera, microphone, and accelerometer will be running during separation from the rocket, and data will be downloaded soon after.

GPS receivers are also carried in addition to the regular navigation systems. This will allow onboard processing of orbital data. The primary

aim of this equipment is to demonstrate that it is possible to generate the position and attitude of an AMSAT satellite by analyzing the GPS data.

Conclusion

One thing we in AMSAT-UK have been very pleased about in the past is the support of all the radio amateurs here. Whether or not they are interested in satellite communications, most recognize that a lot of hard work is put in by many unsung heroes and they wish us well; we seem to be doing something right. AMSAT-UK is just one of many international groups working together to keep trends in amateur radio up-to-date. If you would like to give us more than just verbal support, why not join and / or contribute directly? Your money will not be wasted (P3D's cost of several million dollars mostly came from voluntary donations). See the AMSAT-UK Web page at [<http://www.uk.amsat.org>], or write to AMSAT-UK, 40 Downsview, Small Dole, West Sussex BN5 9YB, enclosing a large (no smaller than 9 x 12) SASE, with 5 x IRC or \$3 for airmail postage.

Acknowledgments

- The AMSAT Phase-3D Project, © Norbert Nuthoff DF5DP, Ph.D. Seven-part series in *CQ DL*, 1997. Translated from German by DG1EFR and WB8IFM.

- AMSAT workers too numerous to mention

- Web sites such as:
[<http://www.amsat.org/amsat/sats/phase3d.html>]
[<http://www.magicnet.net/~phase3d/>]
[<http://www.amsat-dl.org/p3d.html>]
[<http://www.amsat-dl.org/p3dqrg.html>] (for updated frequencies)
[<http://www.arianespace.com/english/>]
[http://www.jamsat.org.jp/scope/index_e.html]
[<http://www.amsat.org/amsat/articles/g3ruh/124.html>].

- Thanks also to James Miller G3RUH and Peter Gülzow DB2OS, for proof checking and suggestions.



Photo F. Model of P3D.

Continued on page 58

Low-Cost P3D Antenna Setup

These three antennas are perfect for everybody.

Assembling a satellite ground station can take many paths, and with the advent of the "Phase 3-D era" (P3D), the amateur satellite operator has even more options. The advice common in the last several years may be considerably "dated," as it is most often targeted at Low Earth Orbit (LEO) satellite operation or the venerable AO-10, which often have conflicting requirements. P3D offers the opportunity to do things a little differently.

Presented here are a trio of antenna designs ideally suited for the P3D operator on a budget, or perhaps one with an inclination towards home-brewing. These designs are just one combination of suitable solutions and are not intended to describe the optimum system, but merely one that will work well for a minimum investment.

Introduction

One of the most often cited obstacles to entry into the world of amateur satellites is the cost of the large and expensive U/V array typical of an "OSCAR-class" station. These large arrays are *de rigueur* for many serious satellite operators to work AO-10, where 15 to 18 dBi gain is needed to communicate reliably at apogee. But does P3D have these same requirements?

These antennas are elementary and scalable designs. They are practical, easily replicated, and inexpensive to build. Included are a pair of beams for 2 meters and 70cm and a novel helix

design for 13cm. The builder may choose to employ fixed circular polarity, or use switchable polarity.

These antennas are designed with the AMSAT-DL recommendations as a prime guideline, and are smaller than the "OSCAR-class" ones mentioned above — much smaller.¹ This smaller

size leads to less gain. Less gain means wider beamwidth. Wider beamwidth allows less-critical pointing. The inference one may make is that automated (and expensive) tracking is not mandatory for P3D. To this end, I offer below designs that will all fit within an imaginary 5' by 5' (1.5m x 1.5m) box,

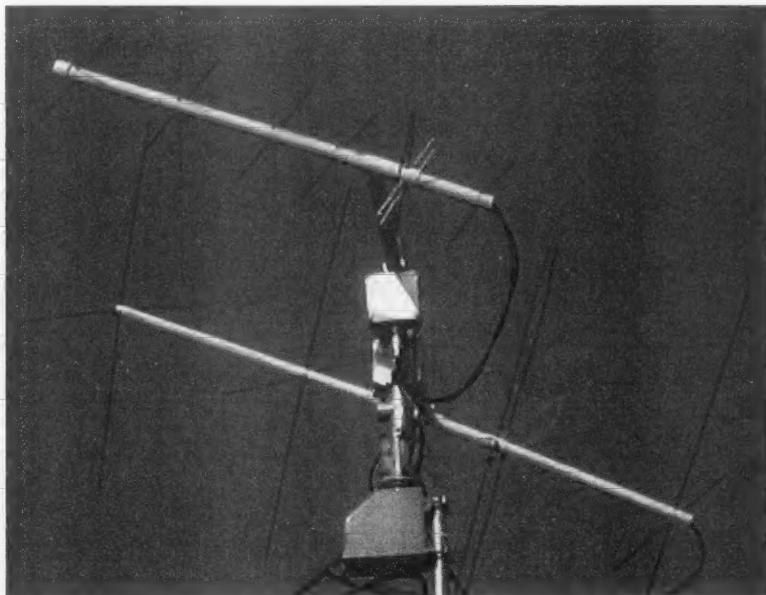


Photo A. The UHF/VHF beams during "field trials."

First published in the *Proceedings of the 15th AMSAT-UK Colloquium*, July 2000.

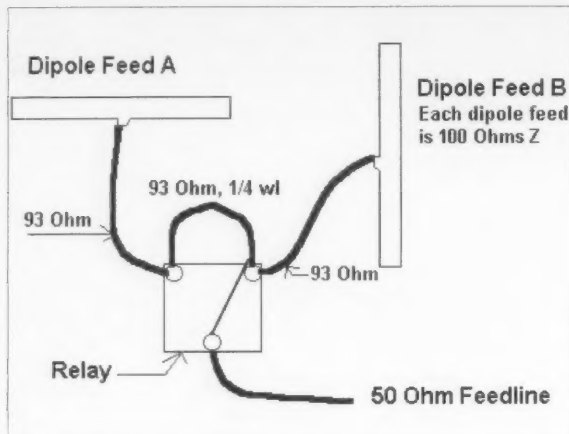


Fig. 1. Basic feedpoint configuration of beam antennas.

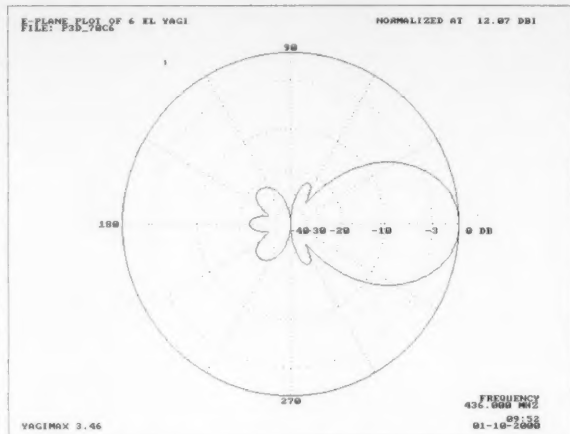


Fig. 2. 70cm beam free space azimuth plot.

and can be controlled with TV-type rotors or pointed manually.

While designed with P3D parameters in mind, these antennas are suitable for all classes of satellites, from LEOs to P3D to AO-10. They have a little too much gain to work LEOs without elevation control, but they have no problem working *any* current LEO if pointed at it. They do not have quite enough gain to work AO-10 at perigee, but they easily work it out to 30,000 km.

Modes of operation

Mode V/U is the most prevalent

combination in use today for LEOs, but not likely to be as popular for P3D. The numerous U/V stations equipped for AO-10 will likely be the initial contingent to populate P3D. Very quickly, though, mode U/S is staged to become the preferred combination (followed by L/S in a few years). For the transition to mode U/S it will be quite easy for the AO-10-equipped station to simply add a mode-S downconverter using VHF as the IF. Perhaps the idle AO-13 stations will dust off the gear and become active again. For the new P3D station builder, a 2 meter antenna may even be superfluous!

With the preceding in mind, I will describe three antennas designed and built as prototypes in January 2000. The antennas were tested for only a short period, as the author had to leave for an extended stay in Russia. The results for the beam antennas were exactly as expected; the author worked stations on RS-13, AO-27, SO-35, AO-10, FO-20, and FO-29 over a three-week period and confirmed the modeled performance for gain and F/B ratio. The results for the mode-S helix are less conclusive, as the testing was limited to a few weekend passes of OSCAR-11 and one pass of UO-36 with the S-band beacon energized (Merlion operation).

UHF/VHF beam design considerations

The effort began as a design exercise. The original design criteria for the 70cm and 2 meter antennas were (in order of importance):

1. circular polarity;
2. gain of at least 10 dBi (per AMSAT-DL); and
3. F/B ratio of at least 20 dB.

I started with the intent of using 3 x 3 elements on 2 meters and 4 x 4 on 70cm. Modeling, however, quickly showed me that I needed 4 elements to reach the 10 dBi goal and still have a dimensionally tolerant design with acceptable bandwidth. Once committed to a 4 x 4 design on 2 meters, I opted to increase the 70cm design to 6 x 6 elements since I had the physical space now defined by the 2 meter antenna's

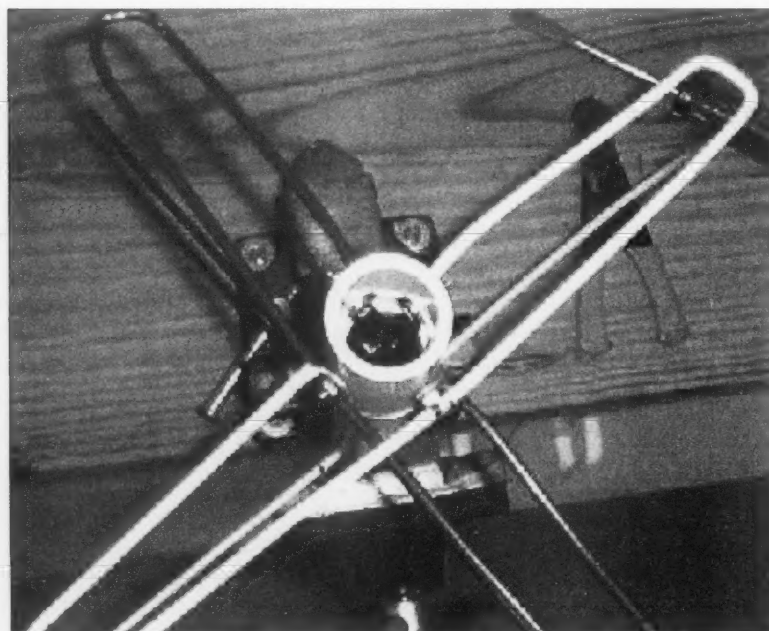


Photo B. 70cm beam feedpoint arrangement inside a PVC coupling.

boom. Both antennas were systematically developed using K4VX's Yagi-Max 3.46, verified for behavior in NEC4Win95, and empirically tested using available analog satellites.

The antennas are designed as linear Yagi-Uda beams, but employing a folded dipole driven element and a phasing line for circular polarity. The physical construction of the folded dipole driven element provides a 4:1 transformation of the nominal dipole feedpoint impedance.² Thus, the antennae are designed with a 25 ohm dipole feedpoint, but constructed with a folded dipole element, resulting in a 100 ohm feedpoint impedance. Then, two of these linear beam antennas are coupled together in parallel fashion via a 93 ohm (RG-62) coaxial cable, producing a summed feedpoint impedance of (approximately) 50 ohms. Circular polarity is effected through a 90 degree phase shift inherent in a 1/4 wavelength section of coaxial cable. This simple, effective scheme is shown in **Fig. 1** and described in detail in *The Radio Amateur's Satellite Handbook*.³ The 70cm antenna produces approximately 12 dBi of gain with a 24 dB F/B ratio, and the 2 meter antenna produces a very respectable 10.6 dBi gain with a 23 dB F/B ratio.

UHF beam construction, 6 x 6 elements

The prototype antenna is constructed

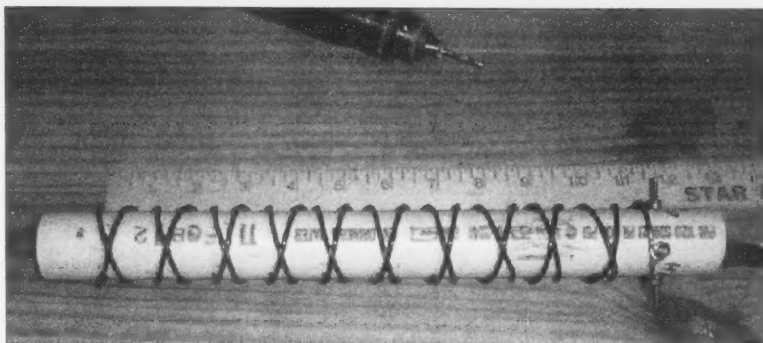


Photo C. Double helix during assembly.

using 3/4" (19mm) PVC piping and #10 AWG insulated copper wire [0.1" (2.5mm) diameter of conductor]. The dimensions are given in **Table 1**.

As is visible in **Fig. 3**, I did not have elevation control available for testing the antenna, but I did manage to work quite a few low-elevation passes of various LEOs with moderate success (with the antenna set at about 15 degrees elevation). I made it into SO-35's very(!) competitive transponder at the northern LOS with this antenna, whereas I could never accomplish that feat with my "everyday" TPM II.⁴ I was also able to work AO-10 with ease out to 30,000 km using 100 watts, working both New Zealand and Europe from Texas with 55+ signals on SSB (between the fades, of course).

VHF beam construction — 4 x 4 elements

This antenna was also constructed using 3/4" (19mm) PVC piping, but I recommend using 1" (25mm) material, as the boom sag on the prototype was noticeable. The elements are fabricated from 1/4" (6.35 mm) copper tubing, the kind used for refrigerator water hookup. This material is very soft and easy to work with, but would not be suitable for areas where snow is a frequent visitor. Aluminum tubing or 3/16" (5mm) rod are commonly available and would make better candidates for a long-term-use antenna. The driven element is formed using #10 AWG insulated wire. The nominal dimensions are given

Continued on page 20

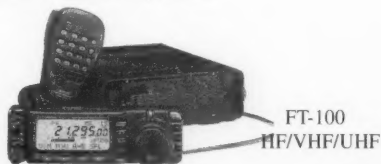
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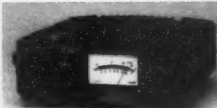
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Element	Length (in./cm)	Distance (in./cm)
Reflector	13.375/34.0	0.0/0.0
Driven Element	12.450/31.6 (x2)	5.75/14.6
Director 1	11.935/30.3	11.00/27.9
Director 2	11.875/30.2	16.00/40.6
Director 3	11.815/30.0	23.50/59.7
Director 4	11.685/29.7	32.00/81.3

Table 1. 6-element UHF beam (x2) dimensions.

Low-Cost P3D Antenna Setup

continued from page 19

in Table 2. If 3/16" rod is used, follow the dimensions given in Table 3.

AO-10 performance, the real test for a 2 meter satellite antenna, was outstanding, as the ability to switch circular polarity made this the better performer when directly compared to my 7-element horizontally polarized antenna.⁵ On uplink, I could reach beacon strength on CW into RS-13 with 5 watts. I really hated to take this antenna down.

Mode S double helix — 10 turns

This antenna started life as an educational endeavor. I wanted to experiment with a design concept at 70cm and then scale it "down" to 13cm. The original idea was to construct a pair of concentric helices with one left-hand circularly polarized (LHCP) and the other right-hand circularly polarized

(RHCP). The premise was that the two helices, at 180 degrees out of phase, would be invisible to each other. I built the first prototype at 70cm to test the operation with the rudimentary instrumentation at my disposal (SWR and field strength meters), then tested it on the air.⁶ This effort proved successful enough that I constructed a 13cm version using the AF9Y "ring reflector" design.⁷ This uncommon design was first proposed by the originator of the helix, W8JK.⁸ An early version of the 13cm helix was used to verify the operation of my Drake 2880 (courtesy of G3RWL, thanks!) using OSCAR 11 as the signal source.⁹ This first antenna was a "single" helix, but I was still able to copy OSCAR 11's beacon with ease. The design parameters are depicted in Table 4, as developed using VK5PGT's Helix 5 software program.¹⁰

This is a small antenna. It is constructed on a 12" (31cm) section of 1" (25mm) PVC pipe (see also the G3RUH and W0OQC designs in reference no. 5). Ten turns of insulated #14 AWG wire are wound 180 degrees apart at the 1-1/16" (2.7cm) spacing shown in Fig. 4. The ring reflector is spaced 1-1/4" (3.2cm) behind the first turn and the feedpoint is directly behind the ring reflector, as shown in Fig. 4. Two helices are wound and fed on opposite sides of the pipe.

The double helix proved to have more than enough gain to repeatedly hear OSCAR 11 at an S2-S5 when pointed straight on to it (I did not have elevation control).

The rated 16.5 dBi gain is hard to verify (and is the subject of considerable doubt), and the beamwidth appears to be in the 45-60 degree range.¹¹ The F/B ratio also does not appear to live up to published figures, as I could detect a fairly strong signal off the back lobe.

The ability to

Element	Length (in./cm)	Distance (in./cm)
Reflector	39.375/100.0	0.0/0.0
Driven Element	38.400/97.5 (x2)	17.0/43.2
Director 1	36.500/92.7	36.0/91.5
Director 2	36.250/92.1	56.0/142.2

Table 2. 4-element VHF beam (x2) dimensions (1/4" tubing).

Element	Length (in./cm)	Distance (in./cm)
Reflector	39.750/101.0	0.0/0.0
Driven Element	38.400/97.5 (x2)	17.0/43.2
Director 1	37.830/96.1	37.0/94.0
Director 2	37.560/95.4	58.0/147.3

Table 3. 4-element VHF beam (x2) dimensions (3/16" rod).

Frequency	2401 MHz
Axial length	10-7/16" (265 mm)
Turn spacing	1-1/16" (25.6 mm)
Helix diameter	1-7/16" (27 mm)
Pitch angle	13 degrees
Length of wire	9 ft. 7-3/4 in. (2.94 m)
Beamwidth	38 degrees
Impedance	130 ohms

Table 4. Double helix design parameters.

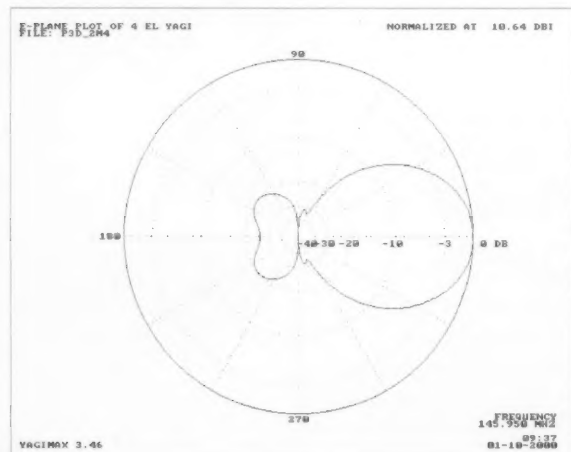


Fig. 3. 2m beam free space azimuth plot.

switch circular polarity proved interesting, as I found only about a 6-9 dB difference on OSCAR 11, but it was easily 20 dB or more on local "noise" (DDS dishes). Photo D shows the double helix, the weatherproof box holding a coaxial relay, and a Drake 2880 downconverter. Each helix's feedpoint is cabled out to one port of an SPDT relay, and the relay common is cabled to the downconverter.

Subsequent efforts to model this design in NEC4Win95 required use of the "virtual" version, capable of an unlimited number of segments.¹² I used 16 segments per turn and soon learned that the antenna is far from an optimal design. For those wishing to improve this rudimentary design, a significant improvement in both gain and pattern can be made by tapering the coils from back to front in both diameter and pitch. This modification, however,

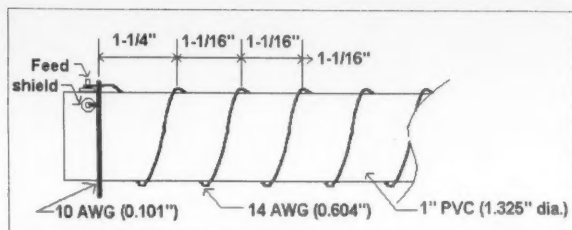


Fig. 4. Double helix configuration.

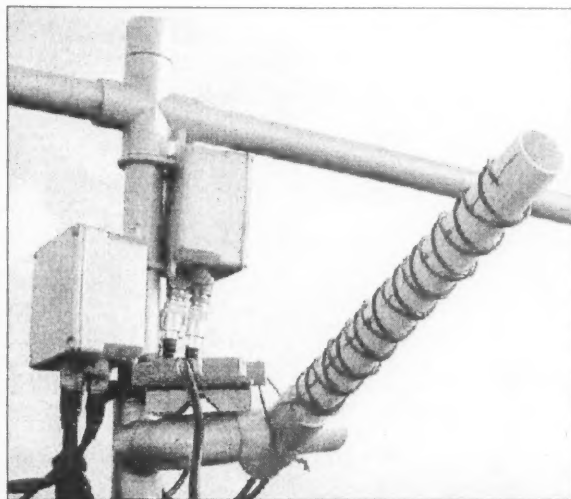


Photo D. Double helix during "field trials."

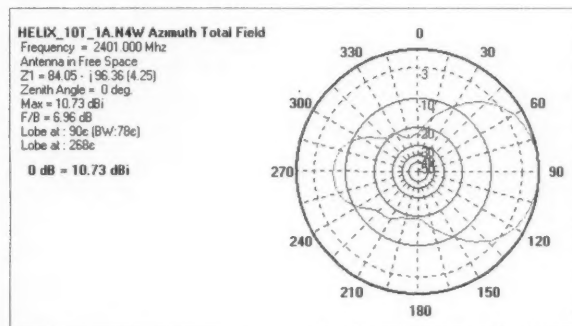


Fig. 5. Double helix free space azimuth plot.

obviates the original intent of simple construction on a common piece of pipe. Fig. 5 is the gain pattern for the built and tested version. You will note that the observed poor F/B ratio was confirmed in the model, and interestingly, the impedance match and the gain were both better at 2200 MHz: 1.7 SWR at 17.25 dBi.

Conclusions

These antennas are small and inexpensive to build, and promise to be

effective for P3D. Their small size contributes to their intrinsically wide beamwidth, allowing the ground station to employ either simple az/el controls or possibly even manual pointing. A computer-based automated tracking system need not be a concomitant appliance. For US-based operators, they are good candidates for portable Field Day operation with "Armstrong" rotators. For those interested in viewing more detailed color photographs, please see: [http://members.aol.com/k5oe].

References

1. Frank Sperber, *AMSAT-DL Journal*; see: [http://www.qsl.net/d16dbn/amsat/adlj-bod.htm].
2. *The ARRL Antenna Book*, 16th ed., ARRL, 1992, pp. 2-32, 4-8.
3. Davidoff, Martin, *The Radio Amateur's Satellite Handbook*, ARRL, 1998, pp. 9-4-9-6.
4. Brown, Gerald R., "The Texas Potato Masher II Antenna," *Oscar Satellite Report* #413, September 1, 1999; or see: [http://members.aol.com/k5oe/tpm2.htm].
5. Brown, Gerald R., "A Modest AO-10 Antenna," *The AMSAT Journal*, Jan. 1999; or see: [http://members.aol.com/k5oe/ao-10.htm].
6. For information on the experimental 70 cm double helix antenna, see: [http://members.aol.com/k5oe/doublehelix.htm].

7. For information on the AF9Y "ring reflector" helix, see: [www.webcom.com/af9y/helix.htm].

8. Kraus, John D., "A Helical-Beam Antenna Without A Ground Plane," *IEEE Antennas and Propagation Magazine*, April 1995, p. 45.

9. Brown, Gerald R., "That Darn Drake," *The AMSAT Journal*, Mar.-Apr. 2000, or see: [http://members.aol.com/k5oe/drake.htm].

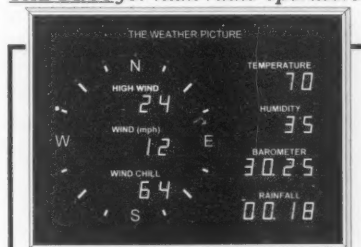
10. To download a copy of Helix 5 from VK5PGT, see: [http://members.iweb.net.au/~gsthorn/].

11. Emerson, Darrel, "The Gain of An Axial-Mode Helix Antenna," *Antenna Compendium Volume 4* (ARRL), 1995, pp. 64-68; or see: [http://ourworld.compuserve.com/homepages/demerson/helix.htm].

12. NEC4Win95: [http://www.orion-micro.com/n4w95/n95page.html].

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How do you go on a family vacation and still have time to make dozens of satellite contacts? Take a cruise! A typical vacation is actually a lot of work, and there is rarely a moment to escape into ham radio.

If your vacation involves travel, that usually means driving or flying. If you are driving, there is a chance that you can set up for mobile satellite operation. I have been experimenting with this type of operation for over 20 years, with many successful contacts. The mode "B" (70cm up and two meters down) transponder on AMSAT-OSCAR-7 and the mode "A" (two meters up and 10 meters down) transponder on AMSAT-OSCAR-8 were excellent resources back then. The satellite receivers were quite sensitive,

and the transmitters were quite readable on the ground with the help of preamplifiers.

However, problems occur when you mix satellite chasing with vacation driving. It is not a good idea to drive while attempting satellite contacts. Unlike typical VHF/UHF FM operation, or even shortwave activity, satellite contacts require more focus on the radio. In addition to tuning in a station to contact, it is necessary to adjust the transmitter frequency to match the targeted downlink. Then, the effect of

Doppler shift will require constant re-tuning during the contact. Obviously it is better to make satellite contacts while stationary. The single-channel FM satellites are somewhat easier, but still require concentration. It's not always easy to explain to family members why you're pulling off the road to play with the radios. And since the satellites are only available for contacts when they are above your horizon, your operating schedule is strictly dictated by their availability.

If your vacation travel involves

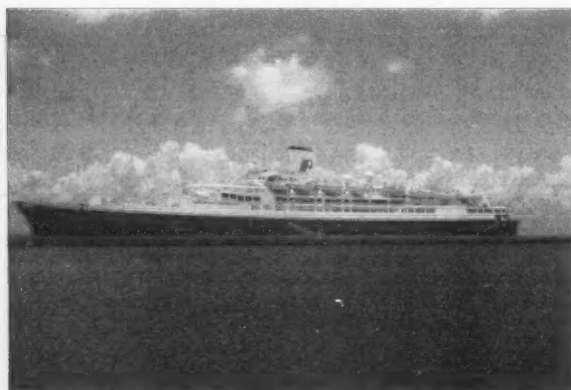


Photo A. The Premiere Cruise Line's Big Red Boat III docked at Cozumel, Mexico.



Photo B. Heather WB5RMA and Andy W5ACM celebrate their 25th wedding anniversary during the cruise.



Photo C. The typically vacant radio room on the Big Red Boat III.



Photo D. The radio communications system on the bridge of the Big Red Boat III was well maintained.

commercial air travel, time for satellite chasing becomes extraordinarily limited. You can forget about making contacts on the way to the airport, in the airport, on the airplane, and during travel from the distant airport to your final destination. It doesn't happen. I've tried it.

When you get to your vacation destination, it's time to unpack, get oriented, check schedules, and, if you are visiting friends or relatives, sit down, talk, and socialize. You'll be really lucky to find some opportunities to get ready for a satellite pass and operate. If you do, you will likely have an audience of nonhams who will not be impressed by your ability to talk to other techno types on ham radio when a cell phone or the house phone would have been easier.

If your final destination is a remote cabin or campout, your time is not your own for other reasons. Taking care of "maintenance" chores tends to dominate free time. When you're not hiking, sleeping, or eating, it's time to plan, organize, or clean up. It's possible to break away for a few quick low-orbit satellite passes, but once again, there is usually an audience or something else that is not being done that is theoretically your responsibility.

It's cruise time

If you can make time while at home to pursue satellite contacts, you will be able to find even more hamsat time while on a cruise. Does this sound incredible? It's not. There are

some surprising reasons why you can easily make time to get on the air.

First, you are on vacation, a real vacation. The hardest part of a cruise is getting you, your family, and all your luggage on the boat. You may have to drive or fly to the port and, once you are there, stand in line, fill out forms, and hand over your plastic wallet stiffeners for scanning and bank account trimming.

Then, all of a sudden, you are on board. You find your cabin, discover your luggage outside your door, read about shore excursions and cruise events, check the eating schedule, and kick back. Your work is done. The next time that you will be a focal point of the outing will be when it is time to load your suitcases full of clothes in need of wash, and things that you and the family have purchased in foreign ports, into your UAV (Urban Assault Vehicle) or sedan.

Hamsats and the cruise

In recent years, cruises have become very popular. Before affordable air travel, the boat was the only way to visit foreign countries and islands. For most, the boat ride was just the means of getting from point A to B. Cruises today are not just the means, but a primary part of the vacation. Cruise ships are floating cities whose sole purpose is to provide entertainment and relaxation for the passengers.

The majority of cruise lines that work U.S. ports go to the Caribbean, Mexico, and Alaska. They have excellent

musical acts, comedians, onboard pools, activities for kids, organized shore excursions, private cabins, gambling casinos, video arcades, formal events, spas, exercise equipment, movies, and phone and Internet access. Some even have satellite TV. But most of all, they have lots and lots of food and free time. If you're going on a cruise, start



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Photo E. Heather WB5RMA takes the wheel during a bridge tour.

planning your after-the-trip diet now, but don't bother to hold back while on board. It's not worth it. You will really miss out if you don't indulge in the multi-course meals.

Between ports of call, these boats spend a lot of time on the water. This is when you are supposed to calm down, enjoy, and do nothing. Personally, I am not that interested in hanging out in a floating bar or leaving all of my cash in a casino. I enjoy the entertainment, the food, the shore trips, and shooting skeet from the rear deck. I also find satellite contacts from remote locations fun and relaxing. You live on the boat for the duration of the cruise. There are many opportunities to sit in

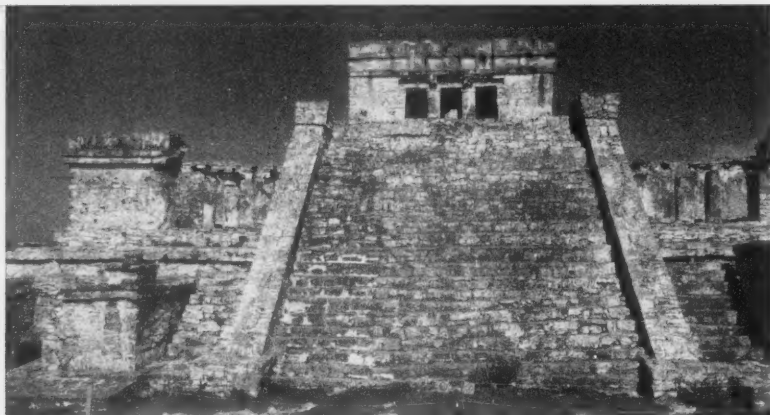


Photo G. The Mayan ruins at Tulum in Mexico were incredible.

a lounge chair on an upper deck and tune the FM satellites like AO-27 (AMRAD-OSCAR-27) and UO-14 (UoSAT-OSCAR-14) with an HT (handie-talkie). If you work it right, other members of your family or group will hardly notice if you catch a few passes each day. Unless they harbor anti-ham thoughts about your hobby, they may actually be impressed and interested.

While celebrating our 25th wedding anniversary on a cruise to ports in Mexico, Heather WB5RMA took care of logging station call signs on a few passes. My oldest son Collin took pictures for this article, and my youngest son Brett enjoyed plotting GPS coordinates on a map.

Permission to operate

Three years ago we went on a Carnival cruise to the Caribbean. The ship was registered in Panama, so I went by

the ship's radio room to see if they had any problems with my proposed HT operations while on board. They didn't. In fact they were rather surprised and interested that I intended to make contacts via ham-radio satellites while on their ship. I was warned, however, not to operate during times when the ship would be using the VHF and UHF communications gear, i.e., when approaching or leaving port and during any emergencies.

While on our anniversary cruise on the Premier Cruise Line's *Big Red Boat III* [<http://www.bigredboat.com>] last summer, I went by the radio room twice, but no one was home. There were instruction sheets on how to make phone calls from your cabin, and a stack of blank FAX sheets for those who didn't quite succeed at leaving work behind. This boat was registered in Nassau (other Premiere boats are registered in the Bahamas, Panama,



Photo F. Food sculptures are typical on cruises.



Photo H. Andy W5ACM makes another UO-14 contact from a rare grid square in the Gulf of Mexico.



Photo I. Andy WSACM checks the GPS receiver with a Palm VII, while on the cruise.



Photo K. Lee KØLEE made over 120 contacts while on an "inside passage" cruise to Alaska.

and Liberia), and I decided that it was better just to go ahead and ask forgiveness later, if necessary, and start operating. On this trip, I noticed that there were a lot more folks with cell phones, FRS (Family Radio Service) HTs and GlobalStar satellite phones. Since I didn't have a big HF rig, and didn't start stringing up dipoles, I almost fit right in. Note that it can be rather entertaining to listen in on the FRS frequencies (462.5625–462.7125 & 467.5625–467.7125 MHz in 25 kHz steps) in between satellite passes.

Unless you take the time to apply for licenses in the countries where the ship docks, don't plan on operating on shore. The rules and regulations of the foreign ports are not ignored just because you showed up on a cruise. It also won't fit your schedule. Time is limited in port. Make the most of it. There are sights to see and things to do that you may never have another

chance to see or do again. Our cruise visited Vera Cruz, Playa del Carmen, and Cozumel, Mexico. I focused on the family, a submarine ride via Atlantis Adventures of Cozumel, and the incredible Mayan and Toltec ruins at Tulum and Quiahuixtlan respectively. I'm ready to go back!

Your shipboard station

It's possible to pack everything you need in a small camera bag. My system consisted of an Alinco DJ-580T dual-band HT, Diamond RH77B dual-band 15" whip, MFJ 1712 telescoping dual-band whip (7.5" collapsed and 19" extended), Arrow II dual-band hand-held yagi [<http://members.aol.com/arrow146/index.html>], spare 12 VDC battery pack for the HT, the HT's charger, DeLorme Earthmate GPS receiver, Palm VII with Pocketsat and Solus Pro software, earbud headphones,

handheld microphone, spare batteries for the GPS unit and the Palm, a grid square map of the Gulf of Mexico and my AMSAT Satellite Frequency Chart. With the exception of the Arrow antenna, it all fit in the camera bag, with the tip of the Diamond antenna hanging out a few inches.

I intended to do some experiments with the different antennas, but found that the convenience of the collapsible MFJ whip made it the antenna of choice. It was easy to carry and use around the ship. The Arrow spent the whole cruise in a suitcase down in the kid's cabin. Had I gotten it out, contacts would have been easier, but I still managed to successfully complete over 100 QSOs from nine rather rare grid squares in the Gulf, using UO-14 exclusively (145.975 up and 435.070 down). I have since discovered the Pryme Model AL-800-BNC dual-band telescoping whip. It is 9.5" collapsed



Photo J. The GPS receiver, computer, radio, and other accessories were compact, easy to use, and effective while on the vacation cruise.



Photo L. Russ K5NRK's QSL card from his trip to Lake Powell in Utah.

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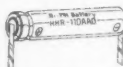


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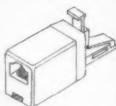
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and 34" extended. It is a remarkable portable performer for satellite work.

The radio, an Alinco DJ-580T, was chosen because I was familiar with its operation. It has five watts out with the large (12 VDC) battery pack, and it is full duplex; I can transmit on one band while simultaneously listening on the other. I have been using it for portable FM satellite work since AMSAT-OSCAR-21. Any dual-band HT that has a few watts out and can do full duplex will do well. Some satellite chasers have succeeded with a dual-band HT that is not full duplex, but it takes practice. The earbud headphones and the handheld mic are extremely useful when positioning the HT for the best signal, and avoiding feedback through the satellite.

Orbits and location

The biggest issue is knowing where you and the target satellites are at any given moment. One solution is to plot all of the orbits for all of the satellites you wish to work prior to the trip. This requires that you know the complete itinerary for the boat. Then you can print out all of the predictions using your satellite tracking program of choice. I have used GrafTrak from [<http://www.rcallen.com>] since there are still Y2K glitches with my version of InstantTrak. Location approximations are usually good enough. Adjustments can be made during the actual pass.

This time, I had a Palm VII with a very effective tracking program, PocketSat. You can download a shareware version of PocketSat from [<http://www.palmgear.com>]. The latest revision (V2.0) provides color support for those who have the Palm IIIC. The shareware version is fully functional, but limited to tracking five satellites at a time. This is quite adequate for those who only want to keep up with the FM satellites and a few others. The program's only deficiency is that it will not track AO-10, or other non-circular-orbit satellites.

Prior to the trip, I put in a recent set of satellite elements and ran some predictions for the first day offshore. The results were identical with those plotted by GrafTrak. Whenever I wanted to check out some passes on the cruise, I

put in the coordinates from my GPS receiver and let the program run. The GPS receiver was a key part of my gear. The DeLorme Earthmate GPS receiver [<http://www.delorme.com>] connects directly to the Palm. Using DeLorme's Solus Pro software, I could get my exact location quickly. Some GPS receivers will also provide the current grid square. Mine did not, so I also had a grid-square map from [<http://www.ar1.org>]. Most of the operators on the FM satellites are grid square collectors. It's fun operating in uninhabited grid squares. You become rare DX.

I wasn't the only one

Other satellite enthusiasts were also riding the high seas during the summer. Lee Devlin KØLEE [<http://members.aol.com/Lee810/ham.html>] took the inaugural "geek" cruise [<http://www.geekcruises.com>] called the Perl Whirl. Lee used a Yaesu FT-51 HT and an Arrow II antenna to make over 120 contacts from 15 different grid squares. While making a UO-14 contact, Lee was interviewed by a writer from *Wired* magazine who was fascinated with the concept of using an FM hamsat to make contact with other hams in the lower 48, as well as a few Alaska regulars. Lee's cruise was through the Alaska "inside passage," and had other hams on board like Steve K4HG of APRServe fame [<http://www.findu.com>] and Steve N4RVE [<http://www.microship.com>]. A fun feature of Lee's cruise was a flight on a DeHavilland Otter to a camp up the Taku River for a Salmon cookout.

Russ Tillman K5NRK (Vice President of AMSAT Publications) worked UO-14 as maritime mobile on the MV CPR while on vacation at Lake Powell in Utah. While he wasn't out on the ocean, a lot of the conditions were the same. During his week stay, Russ contacted over 20 stations using only a two-watt HT and a whip antenna. He is already making plans for vacation next year with gear for AO-10 (AMSAT-OSCAR-10), AO-27, FO-20 (Fuji-OSCAR-20), FO-29 (Fuji-OSCAR-29), RS-13, UO-14, and possibly Phase 3-D

Continued on page 58

From Russia, With Satellite

"The name is Brown, Jerry Brown."

This is not a "how to" on operating satellites in a foreign country, but rather an informal accounting of one amateur radio operator's brief experiences in Russia. If you think you would like to operate satellites from another country, your first place to gather information might be the ARRL's Web site [www.arrl.org]. For information about operating in Russia, visit KØXQ's excellent site at [www.rossiya.net/k0xq.htm].

I had the opportunity to spend six months in provincial Russia earlier this year (February through August), mostly in the formerly closed city of Dzerzhinsk (used to be called Gorky in Soviet times), about 500 km NE of Moscow. It took four months to acquire my Russian operating license from the Glavgossvyaznadzor Rossii (GGSN, the Russian version of the FCC) in Moscow (to see a copy of the GGSN license, go to: [http://members.aol.com/grbrownrussia/license1.jpg]). That time was followed by considerable travel in-country to St. Petersburg, Moscow, and Krasnoyarsk (the Ural Mountains in central Siberia), leaving me with only a few short weekends for active satellite operation.

Operating conditions

I lived in a converted apartment building, now a hotel, the most common dwelling all over Russia. My 3rd floor room had a balcony, but unfortunately it only had exposure to the north and east. I was completely blocked by taller buildings from 130 degrees to 350 degrees azimuth. As you can probably imagine, Siberia and the arctic are not hot spots of amateur satellite

activity. Still, many of the satellite footprints would reach into eastern Europe while the satellite was east of me.

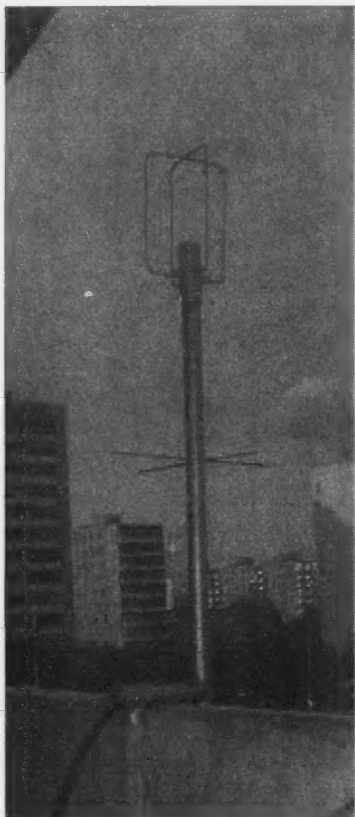
My station consisted of a Yaesu FT-100 and three home-brew antennas: a 10 meter dipole, a 2 meter ground plane, and a 70cm Eggbeater II. (For further information on this antenna, see Brown, Gerald R., "The Eggbeater II Omni-direction LEO Antenna," *The AMSAT Journal*, Sept./Oct. 1999, pp. 14-16, or [http://members.aol.com/k5oejerry/eggbeater2.htm]). You may

think a nonduplex radio and simple, omnidirectional V/UHF antennas are far from optimum for satellite ground station operation, and you are right. But that does not mean that with a little work and persistence, you cannot make contacts and you cannot have fun. I sure did both!

The Yaesu FT-100 was an ideal rig for my little DXpedition. It allowed me to work HF (my main interest was the IARU HF World Championship), work satellites in "split" mode (albeit,



Photo A. Station setup.



**70 cm Egg II,
2 m vertical**



Photo B. V/UHF antennas on the balcony.

not full duplex), and is small enough to carry in my hand luggage, along with a tiny MFJ MightyLite power supply. One

pleasant surprise was the effectiveness of the DSP in FM mode — not a feature my full-size rig at home has available.

The antennas were also small and portable, but these were carried in my checked baggage. I used nothing more than some PVC pipe and common house wire for the antenna construction. The 9913F coax for the 70cm antenna was the heaviest and bulkiest item in my portable station arsenal.

Working the easy ones

I thought the FM birds would be easier than in North America, simply due to less "competition." I also thought AO-27 would be my best choice. I was wrong on both counts.

The QRM on AO-27 was horrific! I never made a single successful QSO on that workhorse mode J satellite. As the bird came over my northern horizon, the uplink is captured by what appears to be a 2m CW beacon, although I could never discern what intelligence lay behind the seemingly random characters being sent (no, it was not RS-12/13). As the bird moved down over central Siberia, FM broadcast music dominates the downlink, with an occasional strong Russian station able to break in and make a call. I heard a few successful Russian QSOs, but never heard any from Scandinavia or Europe.

UO-14 was a different story. I found contacts easy and plentiful on this recently activated mode J satellite, including several with some old AO-10 friends. It was a real treat to hear familiar calls like LY3BH, OZ1MY, and ONIDLL on a Low Earth Orbit (LEO) satellite! Unfortunately, the FM LEOs don't offer the opportunity for rag-chewing like AO-10. My biggest regret was not being able to hear the bird when it was west of me, giving me the opportunity to QSO with old AO-10 friends from Italy, France, and the UK. I never heard SO-35 turned on over Russia.

Working the SSB satellites

The SSB satellites are my preferred form of satellite communication, affording more time to have a pleasant conversation and getting to know the operator on the other end a little better than is possible on the rapid-fire, ever-so-popular, FM birds. Making

 		DZERZHINSK RUSSIA		CQ:16 ITU:29 Loc:L026				
<h1>R3/K50E</h1>								
<i>Джеральд Р. Браун (Джерри)</i>								
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CONFIRMING QSO WITH	DATE DAY MONTH YEAR			UTC	MHz	RST	MODE 2-WAY	QSL
								PSE TNX
<small>An UA3AA QSL</small>								

Photo C. My Russian QSL card.

successful contacts on SSB using a nonduplex rig involves using one, or both, of two techniques:

1) Calling CQ and scanning a range of the expected downlink pass-band. This was effective on RS-13 and FO-20, where the SSB "calling frequencies" are fairly standard at 29.480 and 435.850 MHz, respectively. Using mode A (2 meter uplink), I received nice signal reports from UR4MSP and SMØNJO on RS-13. This method is often employed by mode K (15 meter uplink) operators using their HF rigs. Since FO-20 has a much higher altitude than the other amateur LEOs, I made my one and only central European contact with IW1HX on this, my very favorite satellite.

2) Guessing/estimating the Doppler shift and responding to another operator's call. This technique often requires a quick response, checking to see if you are heard, then adjusting your uplink by 1 kHz or so, then responding again. This worked for me on AO-10 and I had a nice QSO with LY3BH on this bird also. Not bad for an omnidirectional antenna, a nonduplex rig, and only 20 Watts uplink power!

Da svedanya

After just getting into the swing of satellite operating on weekend mornings, my work assignment was cut short and I returned home to Texas earlier than planned. Still, the opportunity to work amateur satellites in a foreign country was memorable and exciting, managing two-way phone contacts with the following countries: Germany, Lithuania, the Ukraine, Denmark, Finland, Sweden, Kazakhstan, Russia, Poland, Belgium, and Italy. If you have the opportunity to travel to some foreign locale, consider how much fun you can have working the amateur satellites with small, portable systems and simple, omni-directional antennas. If you are interested in viewing more detailed color photographs, please see: [http://members.aol.com/k5oe] and click on the "Russian site" link.

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PATENT PENDING

Inside Digital TV/VCR Tuners

Part 2: Data transmitter for testing.

This is part two of a series of seven discussions regarding the operation and use of digital TV/VCR tuners. Part one discussed the two types of digital tuners and provided a brief overview of frequency synthesizers as used within a digital tuner.

This part will discuss the data transmitter that I used to control the digital tuner during the study and testing of the tuner. To test a digital tuner, it is necessary to generate a clock stream and data bits, and to provide an enable signal on three

control lines providing input to the tuner. There are a variety of ways that can be developed to provide the control. Those conversant with digital techniques, microcontrollers, and computers will perhaps find them to be the easiest to implement as a controller. In

my case, a person less conversant with digital techniques hardware, I chose to develop a simple data transmitter from readily available parts. While considering the design of the data transmitter, it became evident that I'd need a way of testing its operation once it was constructed. Therefore, a data receiver was also developed, but it isn't a necessary item for exercising the tuner. However, it does provide a visual display of the data sent to the tuner, which is a boost to your confidence level. The data receiver will be discussed in the next part.

The concept of the data transmitter is to side-load the required tuner control data into shift registers and then serially clock the data into the tuner. Fig. 1 shows a block diagram of the data transmitter. This is essentially the same process that would be accomplished by a computer, but in this case, most of the "work" is done manually. Fig. 2 shows the schematic for the transmitter, including the use of a clock counter and anti-bounce start circuit. A single anti-bounce clock switch could be used for clocking data and eliminate the need for the counter portion of the data transmitter. Without

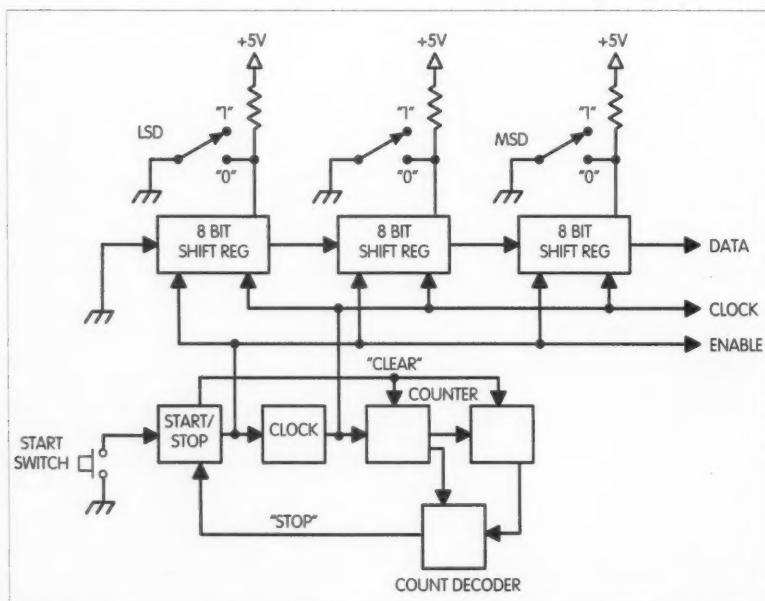


Fig. 1. Block diagram of the data transmitter. Each shift register is side-loaded with 8 bits of data.

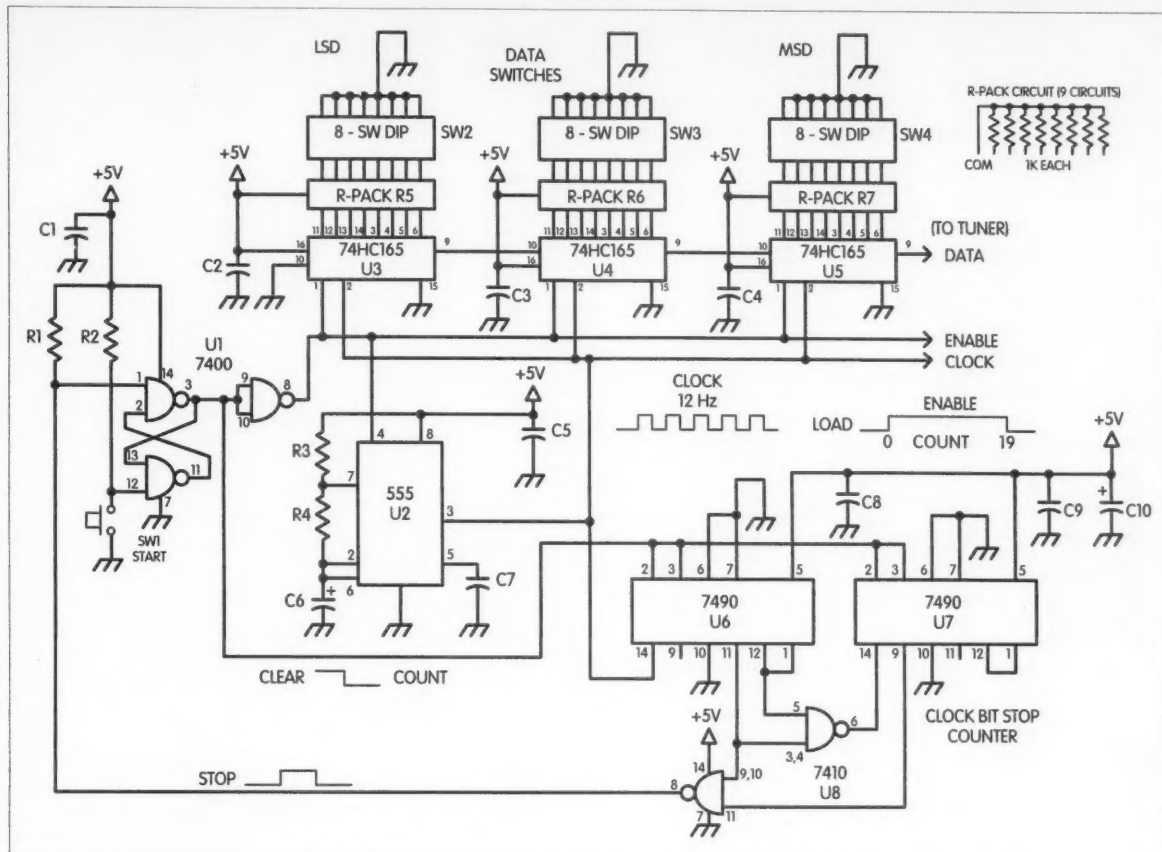


Fig. 2. 19-bit data transmitter generates binary serial bit stream for controlling a digital TV/VCR tuner.

the counter, the operator would have to keep track of the number of clock pulses being provided.

Side-loading of the registers is accomplished using dip switches. I chose to use three 8-switch dip switches and operate them inverted so that electrical "on" is down and up is "off." The objective was to provide a solid LOW at the input of the register for a "0" input. When switched "off," a pullup resistor pulls the node to +5 volts for a logic HIGH.

From an operator's perspective, the switches are down for a data LOW and are up for a data HIGH, which eliminates the confusions of switch logic. In other words, up is a "1" and down is a "0".

At first, I tried using standard TTL 74165 shift registers in the initial design, and found them to be very sensitive to glitching problems. I was unable to resolve the problem even after performing troubleshooting using an oscilloscope and a logic analyzer.

The tests failed to show up the reasons for glitching. By switching to the 74HC165 part, the circuit settled down and behaved as expected.

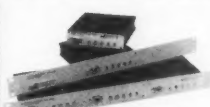
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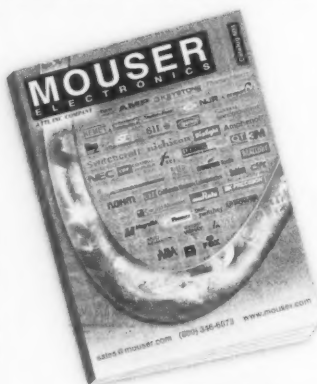
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	U7				U6				
Pin #	11	8	9	12	11	8	9	12	Clock count
Function	D	C	B	A	D	C	B	A	
	0	0	0	0	0	0	0	0	0 (Reset)
	0	0	0	0	0	0	0	1	1
	0	0	0	0	0	0	1	0	2
	0	0	0	0	0	0	1	1	3
	0	0	0	0	0	1	0	0	4
	0	0	0	0	0	1	0	1	5
	0	0	0	0	0	1	1	0	6
	0	0	0	0	0	1	1	1	7
	0	0	0	0	1	0	0	0	8
	0	0	0	0	1	0	0	1	9
	0	0	0	1	1	0	1	0	10
	0	0	1	0	1	0	1	1	20

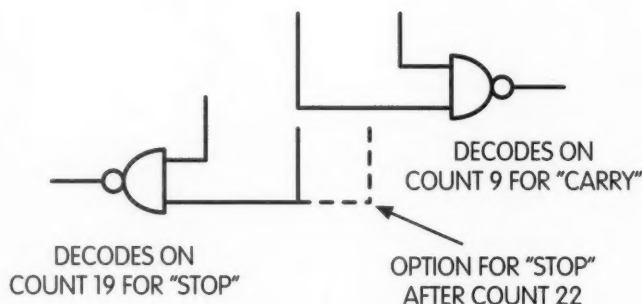


Fig. 3. 7490 IC binary counter and decoder scheme used in the data transmitter.

choice of clock frequency was quite random, and may be at whatever speed is desired by the operator as long as it doesn't exceed 100 kHz. When operating the tuner on the workbench, the low clock speed seems to be adequate. Running it faster did not enhance or detract from the study of the tuner. Starting and stopping of the 555 is accomplished by raising and lowering pin 4, which is the 555's control pin.

Before using pin 4 for start-stop control, I tried free-running the 555 and then gating the output through a logic gate. Although the process worked to some degree, the results were a little unpredictable. Switching the control to pin 4 of the 555 provided positive control over the clock.

Counter

Even though clocking the data manually worked OK, I chose to make the clocking more automatic by using a counter to create a "stop" function at the end of the selected count sequence.

To achieve a bit stream count in the range of 18-20 bits, a pair of 7490 decade counters was selected and connected to operate in cascade. Because 7490 counters do not provide a carry output that is desired to drive a second stage, only a count of nine is obtained from the first counter, instead of the normal ten. The second counter in the chain is the "10s" counter. It is capable of counting to 100, but is stopped at the end of the 19th clock pulse. Decoding

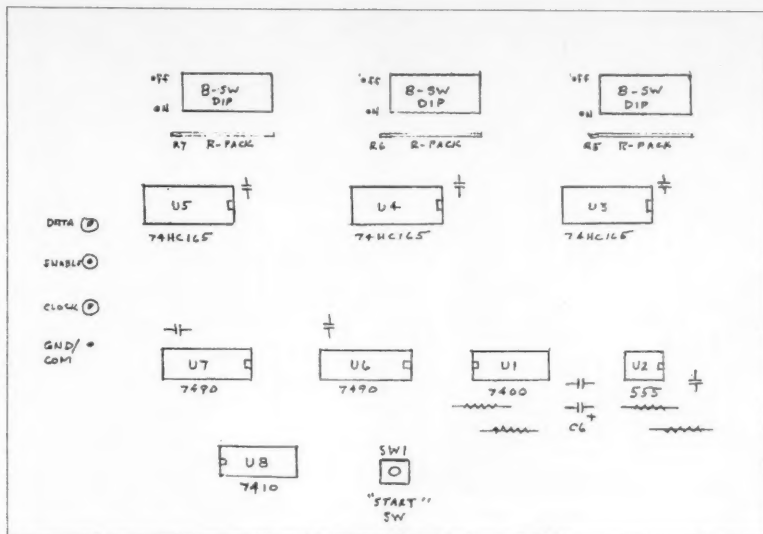


Fig. 4. Component placement for the data transmitter.

the counter from pin 9 of the second counter and pin 11 of the first provides a stop pulse, after the 19th clock, which is transferred back to the antibounce start gate, stopping all operations. Picking up pin 9 from both counters provides a "stop" after the

end of count "22", should the extra clock counts be desired.

A truth table, shown in Fig. 3, was developed to provide visualization of which IC pins to "pick," both for coupling the counters as well as to determine the "stop" bit.

During the counter development, it was unknown which counter pins to use to obtain the desired STOP count. Therefore, to accommodate a variety of decoding schemes, a 7410 triple input gate was selected and is shown in the schematic. However, in the final circuit only two inputs were required for each decoder. If desired, a 7400 two-input gate may be used as a replacement for the 7410, with the appropriate pins being accommodated.

Output circuit

Tuner communication is provided through three wires connected to specific functions generated within the transmitter. The ENABLE line is also the register's LOAD line, which allows the shift registers to be side-loaded with tuner control data when the ENABLE line is LOW. Raising the ENABLE line allows the data to be clocked through the registers into the tuner. There is a "two clock bit" data displacement between a transmitter switch position where it ends up within the tuner's register. Accommodation of

Parts List for Data Transmitter	
R1, 2, 4	4.7k 1/4 W resistor
R3	2.2k 1/4 W resistor
R5, 6, 7	1k R-pack Bourns 4610X-101-102 9-pin SIP or equiv.
C1, 2, 3, 4, 5, 7, 8, 9	0.01 μ F 50 V disc ceramic capacitor or equiv.
C6	10 μ F 16 V radial lead capacitor or equiv.
C10	100-500 F 16 V radial lead capacitor or equiv.
SW1	SPST momentary push switch, any type available
SW2, 3, 4	8-pin SPST DIP switch
U1	7400 quad 2-input gate
U2	555 timer IC
U3, 4, 5	74HC165 8-bit serial shift register: NTE 74HC165, Digi-Key 296-2098-5-ND, Mouser 511-M74HC165
U6, 7	7490 decade counter IC
U8	7410 triple 3-input gate
Misc	IC sockets

Table 1. Parts list for the data transmitter.

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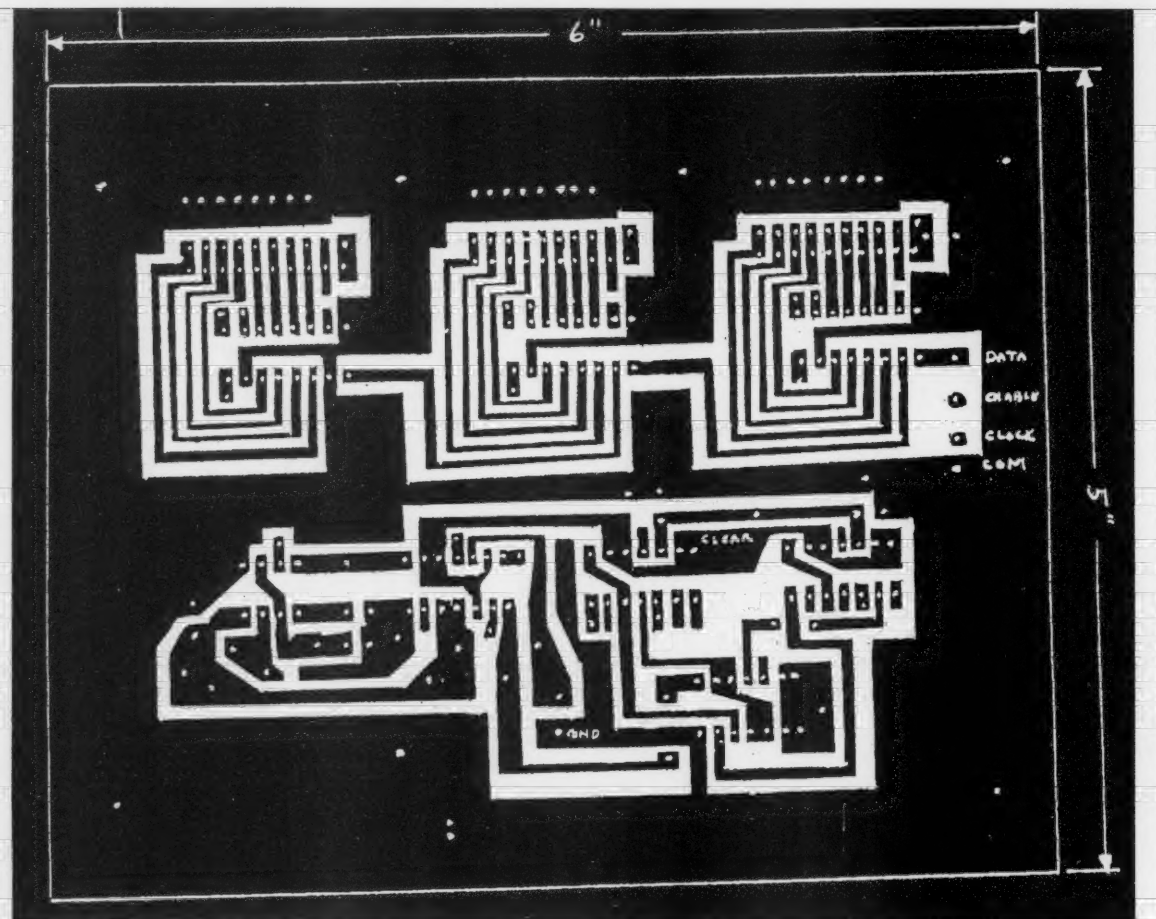


Fig. 5. PCB top foil side.

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the displacement is handled by shifting the data entry position appropriately on the data switches until the data lands into the correct register position. Techniques for finding the correct position are discussed later.

Data output for the tuner is obtained directly from the serial output port of the MSD shift register. To prevent an accidental entry of a "1" in the LSD position during clocking, the LSD register's serial input port is grounded.

A direct output from the 555 provides the clock signal for all of the transmitter functions as well as for the tuner. Buffering of the clock line to the tuner was not required because the 555's output driver will drive a large number of logic loads. However, a clock buffer may be added to the circuit if the user desires.

Packaging

Packaging of the data transmitter was done on a double-sided printed circuit board, where as much ground plane as possible was left on the board. The component placement for my data transmitter is shown in Fig. 4. The parts list is shown in Table 1. Although circuit board construction may not be required for the project, after noting the 74165 glitch issue that occurred, I'd recommend a board if one can be made. In the absence of a suitable board, direct wiring of the circuit may work if the 74HC165s are as glitch tolerant as they appear to be. I used IC sockets on my board so that I could switch ICs around while troubleshooting the glitch issue. I've not observed an issue with the use of sockets on my board.

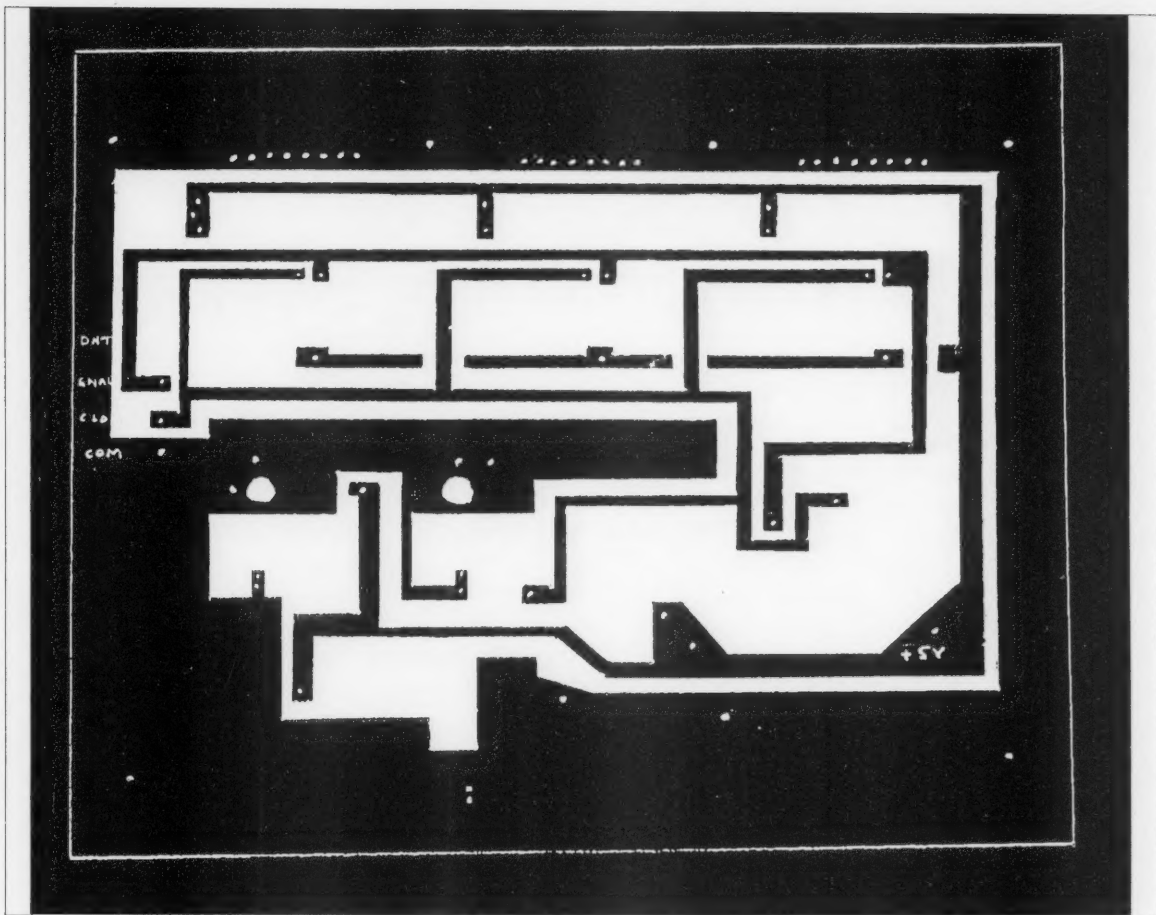


Fig. 6. PCB bottom foil side.

The lower side of the board carries the logic circuit, while the top side carries the clock, enable, and power circuits. Jumper wires were used to complete power circuits that became trapped by logic circuits. "Z"-wires were used to connect power and ground circuits between the two board sides.

It is necessary to provide as much ground plane as possible on the board and use an ample number of bypass capacitors. Bypassing IC Vcc terminals to ground with capacitors having short lead lengths reduces the possibility of logic glitching. At least one or two high value filter capacitors should be used on the Vcc line as well.

Part six of this series will show a procedure and details for making the printed circuit boards for the data transmitter. The procedure described

is simple and provides reliable boards.

The next part of the digital tuner series will discuss the data receiver and then be followed by a discussion of how to interrogate and test digital tuners.

73

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OSCAR-10 Antenna System

A look at the high end of the antenna spectrum.

My satellite station is what is generally considered to be an OSCAR-10-class station. That means that I have long boom circularly polarized yagis with remotely switchable polarization, tower-mounted GAsFET preamplifiers, elevation and azimuth rotators, and high quality coaxial cable. Although many people operate satellites with very small antennas, this is a discussion of the high end of the antenna spectrum. I use this with a Yaesu FT-736R, which many people consider to be one of the best satellite rigs ever built. I have never used the digital satellites, so this discussion will be limited to use of the analog satellites on the VHF and UHF bands.

As of this writing there are six such satellites — three FM “bent pipe” repeaters (UO-14, AO-27, and SO-35), and three analog transponder satellites (AO-10, FO-20, and FO-29). In its current configuration, my station is overkill for the FM satellites, works very well for FO-20 and FO-29, and is marginally adequate for AO-10. If all the predictions about P3D become true, it will work very well for P3D.

As any station is only as good as the weakest link, I will go through each of the parts of the antenna system. This will include some discussion about how or why each component was selected, how it's used and installed, and, in some cases, some different points of view. I will also discuss changes that I would like to make in the future.

The antennas

For antennas, I am using KLM's long boom circularly polarized yagis. For 2m, this is a 22-element crossed element-type yagi (11 elements in each plane) on an 18-foot 10-inch boom. The 430 antenna is a 40-element crossed element-type yagi (20 in each plane) on about a 12-foot boom.

Although these antennas are no longer manufactured, they are not overly hard to find on the used market. For many years, they were considered to be the top end commercially manufactured circularly polarized satellite antennas for 2m and 430 MHz. I bought my antennas from the estate of a silent key. If I were to purchase new antennas today, I would undoubtedly go with the M² antennas, as they are fine antennas and the best currently available manufactured antennas of this type. **Photo A** shows the two antennas as they currently are mounted.

The mounting boom

One of the perpetual discussions about satellite antennas is what kind of mounting boom to use. The purists will tell you that a crossed element-type CP yagi must be mounted on a nonmetallic boom with no conductor of any type (including the feedline) in the antenna pattern. And they are right — to a point. Yes, there will be pattern disruptions by having a metallic boom or other conductors in the antenna pattern. Will you notice a difference? Most likely not — or if you do, it won't be much of a difference.

I have used my current antennas on both a nonmetallic boom and also a steel boom. When I first put my current antennas up, they were mounted on a 12-foot-long wooden boom of 1-inch dowel. This was chosen largely because I happened to already have it. The wooden boom worked OK, but flexed far more than I was happy with. The next step was to install a 2-inch steel mast section about 7 feet long coaxially over the center of the wooden boom, with the mast section well secured to the boom. This gave the strength of the steel and still did not have a metallic boom in the antenna pattern.

This worked out very well and would still be in use today, had I not broken the wooden mast. Hint: Don't rotate the antenna through 180 degrees of vertical rotation from inside the shack (where you can't see the antennas), while your work ladder is blocking the antenna travel. Rotator one — boom zero — time for new boom. After breaking the boom, I used what I had lying around that day, which was a Radio Shack 10-foot mast (R.S. part #15-848). Mechanically that works fine, and I have not really observed any difference in antenna performance. When

I get my tower up and relocate these antennas, I'll likely go back to using a nonmetallic boom, however.

Rotators

If you are installing a large antenna array, you will need to rotate them in both azimuth and elevation. With a short yagi, it is possible to get away with only using azimuth rotation, but long yagis are directional enough that azimuth-only rotation is very limiting. Although there are several options available for the person wanting to put something together, the only currently available commercial product I know of is the Yaesu G-5500 El/Az rotator combination. It's designed for the purpose and it works very well. If you have any thoughts of computer control of the rotators, bite the bullet and get the Yaesu rotator combination. It's designed for it.

If you buy a Kansas City Tracker, it comes with a cable already wired for this rotator as well. I originally used a rotator that, while it was a fine rotator, was *not* well suited for interface-to-computer control. After almost completely rewiring it, I still could not get it to work right. The problem was that the position sense wire in the control cable was also used for one side of the AC power to the brake release. Although the resulting 4 volts of AC hum did not bother the front panel meter at all, it played heck with the analog-to-digital converter in the Kansas City Tracker. I finally gave up and bought the G5500, and am very happy with it.

Preamps

Remember the old ham adage, "You can't work 'em if you can't hear 'em"? This is as true on satellites as anywhere else — if not more so. Although a tower-mounted preamp is normally not required for the FM satellites, and only occasionally on FO-20 and FO-29, it is highly recommended for AO-10. A preamp mounted at the antenna or tower top will make up for even a quite long feedline run.

Make sure that you get a preamp that has built-in relay switching. I am using the preamps from Advanced Receiver

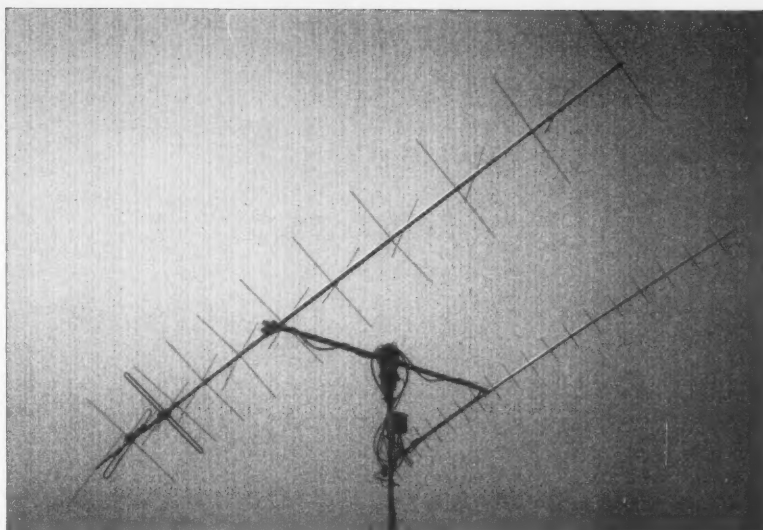


Photo A. Here are the two antennas as they currently are mounted.

Research. Several other companies build fine preamps that will perform very well for the purpose. The preamps I am using are not designed for outside mounting, so I have them mounted in an outdoor electrical box. The box is mounted just below the rotators. The preamps are controlled from in the shack. **Photo B** shows the electrical box with the two preamps installed in it. The preamps are stacked one behind the other so that only the 2m preamp is visible. On the left wall of the box is a terminal strip that connects the power wires to the preamps and the phasing cables for the antennas to a cable down to the shack, where a switchbox I built controls the preamps and antenna polarity phasing.

Support mast

At this time, I am using the bottom three sections of a Radio Shack 36-foot push-up pole (R.S. part #15-5067). This is sitting on a base piece set in concrete and clamped to the eave of my house at about at the 15-foot level. The height of the mast was adjusted so that the back end of the 2m antenna just clears the peak of the roof when the antennas are pointed straight up. Each joint between mast sections is pinned. This is highly important, as the rotational torque of the large antennas mounted at the ends of a long cross boom will cause problems if the mast

sections are not pinned. Do not depend on a friction clamp. One problem with a satellite antenna installation is that it is not possible to guy the mast very close to the rotators, as the guys would foul the antennas when they are pointed up. On the other hand, there is little need to put the antennas very high. Unless there are local obstructions, adding height only adds feedline loss. For this reason, I have the mast no higher than needed.

Continued on page 58



Photo B. The electrical box with the two preamps installed in it.

Roger J. Cooke G3LDI
The Old Nursery,
The Drift,
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NR14 8LQ UK

Satellite Gateways

Time you tried one?

The terrestrial packet network has been with us now for over 15 years and it now seems to be in a decline. There are several reasons for this decline in popularity. At its peak, packet radio was new, no other mode existed like it, and it was a great time for experimenting to see just what could be done. Once established, with links and nodes, passing traffic became more of a service. With the explosion of the Internet, and mobile telephone networks, a lot of the magic of amateur radio has gone. However, there are still some of us "old-timers" who still try to maintain the status quo, and to try to make the amateur network evolve further. Unfortunately some of the original founding amateurs who started the data revolution have also deserted the sinking ship!

The amateur satellite organizations have put an immense amount of work into designing, building and launching numerous satellites over the years. The latest one, Phase 3-D should be in orbit and working by the time you are reading this. This will expand the horizons of a lot of amateurs who are unable to erect large antenna systems in their back yard. Communication across continents should be commonplace and for a large percentage of the day, regardless

of propagation. There are also several Low Earth Orbiters that have been tirelessly working and orbiting the Earth for a number of years. These are the satellites that are of interest to the Data enthusiast, and in particular Uo-Sat-OSCAR-22. This satellite is the one used for the transfer of data from the terrestrial network up to UO-22 and back down again when it appears on the other side of the globe. It is a very satisfying feeling to know that amateurs here can pass mail in this way on

earth, but even this has declined in popularity, largely due to a migration to the Internet and E-mail. I hope that by describing the system, we can encourage more amateurs to use amateur radio for amateur traffic and help support a system that can evolve to even greater things.

If we don't do this, there are greedy commercial eyes looking at our VHF/UHF bands right now and rubbing their hands. If those frequencies are "sold off" we will never get them back again. This is a classic case of "use it or lose it." Anybody can pick up a telephone.

System Hardware

Radio — As the data link operates full duplex, it is necessary to have either two transceivers, or one that can operate both bands simultaneously. The modern ones, such as the FT-847, can do this, so this simplifies the radio requirement. I run the Icom 271/471 combination and it works just as well.

Antennas — The uplink to the Pacsat is on 2 meters and the downlink is on 70cm. Obviously signals are not enormous, so some gain is needed. The

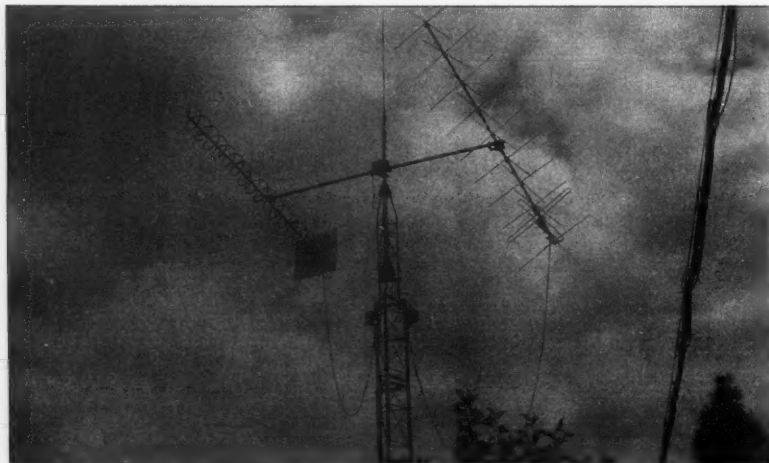


Photo A. Author's antenna system.

minimum requirement for the uplink frequency is something like a 10xy, preferably arranged and phased to give Right Hand Circular Polarisation (RHCP). For 70cm a multi-element beam can be used, or a 16-turn helix. James Miller G3RUH, produces a kit for a 16-turn helix, and it works very well, is easy to assemble and has a very low SWR when tuned correctly.

These antennas are mounted on a 9 ft. boom and, in my case, the whole assembly is on top of a 25 ft. home-made tower. The assembly has to be rotated in azimuth and elevation and for this I use a Yaesu G-5600B rotator combination. I use Landwehr preamps, also mounted on the top of the tower and the feeders, which should be as short as possible, are a piece of LDF-250 for 70cm and UR-67 for 2 meters. My feeder length is about 35 ft., as the tower is just outside the shack. There are many variations on this theme of course, but this is about the average installation. My antenna system can be seen in **Photo A**.

TNC/Modem — The TNC is the old version 1 Tiny-2, running in KISS mode together with a 9600 baud modem, which in my case is the G3RUH modem. This I mounted in a similar box to the TNC and put this on top of the Tiny-2. Connections are straightforward and easy to do. However, these days, there are 9600 baud units all ready to go, and these can be used with no construction time needed.

Computer — This can be anything from a 386 upwards, preferably not less than a 486 however! It is actually much easier to run two computers, networked together. The Satgate runs on one and this talks to the other, running the BBS. For example, in my case I have a 486 100 MHz for the Satgate, and a Pentium 150 for the BBS.

Control — Running all this equipment every day for a large percentage of the day, it is essential that the satellite is tracked on the nose, and also the radio(s) are moved in frequency to compensate for Doppler shift. On a Low Earth Orbiter (LEO) such as UO-22,

Doppler can move the frequency some 15 kHz.

In order to automate the system and save Sysop time and worry, there has to be a method of controlling these parameters. The TrakBox is one such way, and was designed by JA6FTL of Jamsat. It is a stand-alone unit, supplied as a PCB, and has to be built and mounted in a box. With a weekly feed of Keplerian elements, it tracks up to 16 satellites and controls the radio gear, compensating for Doppler shift.

For more information about TrakBox, E-mail Fred Southwell G6ZRU at [g6zru@amsat.org].

Another method is the PCB from Dave Lamont ZL2AMD. This is a PCB that mounts inside the PC, does not use a COM port and is conveniently out of the way. It does a similar job to the TrakBox and takes up less room, plus it saves an IRQ. Contact Dave Lamont ZL2AMD, 510, Kennedy Road, Napier New Zealand 4001;

Continued on page 40

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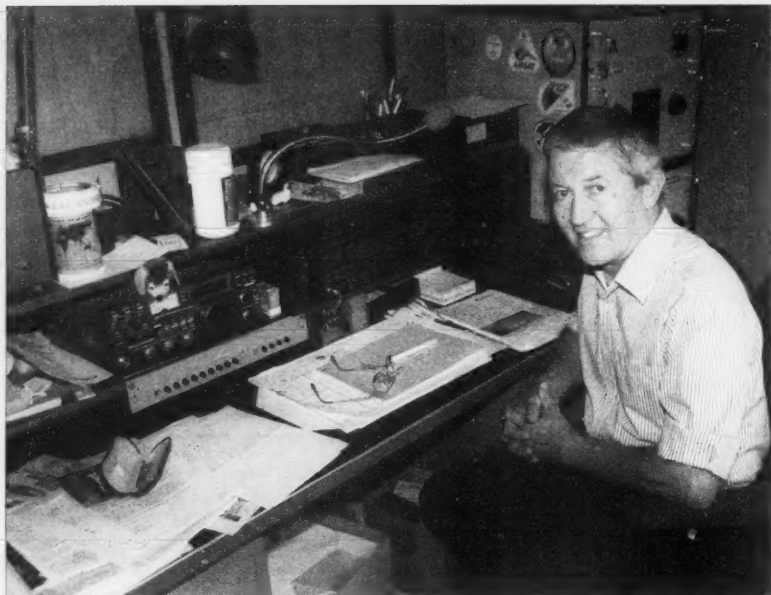


Photo B. Author G3LDI.

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Software — Most amateur computers now use Windows 9x and this is the platform that most Satgates use. It's possible to run both the BBS and WISP software on one machine, but it is easier to use two PCs, networked together. The main BBS program will be F6FBB 7.00g. This runs on one PC, taking the messages from the terrestrial network and forwarding them to a file in a directory in the root of the BBS PC. These come from VHF/UHF and in my case also HF as I run an HF Gateway, too. At a pre-determined time the Satgate PC collects these files and processes them prior to a pass of UO-22. The Satgate PC runs a program called WISP, written by Chris Jackson G7UPN/ZL2TPO. Chris works at the University of Surrey. This continuously tracks many satellites and priority can be given to certain satellites. In the case of the Gateway, priority will be given to UO-22 over all other satellites. If you are tracking KO-25 for example and UO-22 came within range, the gear would leave KO-25 to go and track UO-22.

Prior to the pass, the mail is processed to conform to the protocol used, and a similar post-pass processing

takes place. The mail is then passed to the BBS computer. All this processing software is written by Andrew Sellers G8TJZ. Andrew is pictured in **Photo 2**.

WISP automatically updates the Keps when downloaded from UO-22. These are normally uploaded to the satellite on a regular basis so are usually the latest set. However, it is also possible to subscribe to receive them weekly on the Internet. Obviously it would be a manual job then to update. UO-22 also updates the computer clock; the satellite itself is updated from a very accurate source. When tracking satellites, the Keps and the time are extremely important. WISP satellite tracking software can now be obtained from AMSAT NA for \$60 for members and \$70 for nonmembers. Application should go to AMSAT, 850 Sligo Ave. #600, Silver Spring MD 20910, tel. (301) 589-6062.

For updating the TrakBox with the latest Keps, and also for station details such as latitude and longitude, callsign, etc., Procomm is used.

Setup — Wiring of the hardware is fairly straightforward. Checking out the SWR on the antennas is very important, as is the alignment of the antenna system. I use the Pole Star to

align the antennas. The only disadvantage is that it has to be done at night, so I usually do it in the summer!! Once the software has been loaded and set up correctly, and this can take quite some time, tracking of one satellite can be attempted. I cannot stress enough the need to have the computer clock as accurate as possible, the latest Keplerian elements, and the antennas aligned properly. It will take a few attempts to see any visible data from the satellite, but once that happens, it is very satisfying indeed.

Problems will occur

There is no perfect system, so don't be discouraged if the first few attempts end up as a big zero! There are quite a few Elmers around to ask if you have any queries, and you will have, believe me! Don't be afraid to ask, we all had to.

The satisfaction you will achieve at sending a message this way, whether it be direct or via a Satgate, is much greater than that obtained from using the telephone, so even if you don't intend to set up a satellite station yourself, please try to make use of the Satellite Gateway network. In the short time I have run a Satgate, some three years now, I have noticed a decline in traffic, and that old saying springs to mind — Use it or lose it! Never has this been truer. In fact, as I have been writing this, I received a letter from AMSAT UK, confirming my opening paragraph, suggesting that youngsters these days are only interested in the Internet. Membership of AMSAT UK is now one-third of what it was ten years ago. The very existence of AMSAT UK is now threatened, and it won't be long before this happens in the USA, too.

We can all try to stem the flow and encourage activity, and this is the reason for this article. If I have encouraged just one person to try satellite communications, this article will have been worthwhile. So, next time you send an E-mail to a UK amateur, try the Satgate first. That is where amateur traffic should be, anybody can use a telephone. Think before you link!!! See you on the birds!

CALENDAR EVENTS

Listings are free of charge as space permits. Please send us your Calendar Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the December issue, we should receive it by October 31. Provide a clear, concise summary of the essential details about your Calendar Event.

OCT 8

DIMONDALE, MI The Central Michigan ARC, and the Lansing Civil Defense Repeater Assn., will sponsor "HamFair 2000" at The Summit, 9410 Davis Hwy., Dimondale MI (just minutes from Lansing), 8 a.m.-2 p.m. Vendor setup starts at 6 a.m. VE exams at 10 a.m. (ARRL VEC), 9:30 a.m. registration. Walk-ins welcome, but pre-registration is strongly recommended. First come, first served. E-mail [n8vys@voyager.net]. DX Forum with Bill W8EB, and Ron ND5S, at 10 a.m. See and hear the story of their annual trip to St. Maarten for the ARRL International DX Contest, where they operate as PJ8A. An ARRL Forum will be presented at 8:30 a.m. The Enforcement Forum is a must-see for anyone with questions on how the job gets done, and what Riley Hollingsworth of the FCC has planned for 2000 and beyond. Advance tickets \$5, \$6 at the door; 12 and under admitted free. Advance tables \$10.50, \$12.50 at the door. Please contact J. Ervin Bates W8ERV, P.O. Box 80106, Lansing MI 48908; Tel. (517) 676-2710; E-mail [w8erv@arrl.net]. Hotel accommodations at the Holiday Inn, 7501 W. Saginaw Hwy., Lansing. Call (517) 627-3211 and ask about "the Special Summit rate of \$68 per room!" Fax (517) 627-5240. Located only 10 minutes from the Summit, take Exit 93B.

MEDINA, OH Join the M2M Group for the all new 2000 Medina County Hamfest, Sunday, Oct. 8th, at the Medina County National Guard Armory, 920 W. Lafayette Rd., 1/2 mile west of the fairgrounds. Vendor setup at 6:30 a.m. Open to the public 8 a.m.-2 p.m. Talk-in on 147.030(+). Computer equipment, new and used ham gear, VE exams, contact Fred at (440) 236-3477. Walk-ins always welcome. Indoor tables. Limited outdoor flea market spots available on a first-come first-served basis. General admission \$5 per person at the door or \$4 in advance. Vendors \$9 in advance, \$10 per table on the day of the event. For more information about tickets and registration, please call Mike at (330) 273-1519.

OAKBROOK TERRACE, IL The Chicago ARC, Inc. Hamfest will be held 8 a.m.-1 p.m. Vendors setup at 7 a.m. Go to the entrance at Park View Dr., north from Cermac Rd. (22nd St.), one block west of Route 83. Advance tickets \$4, \$5 at the gate, rain or shine. Enclosed parking lot, open on one side. Free parking and selling spaces. Bring your own

tables. Contact George at (773) 545-3622; or Dean at (708) 331-7764; or write to CARC, P.O. Box 410535, Chicago IL 60641-0535; or CARC, 5631 W. Irving Pk. Rd., Chicago IL 60634.

WALLINGFORD, CT The 8th Nutmeg Hamfest & Computer Show, and the ARRL Connecticut State Convention, will be held Sunday, Oct. 8th, 9 a.m.-3 p.m. at the Mountinside Special Event Facility, High Hill Rd., Wallingford CT. Exit 15 Rte 91 (North or South). Follow signs. Vendor setup starts at 6 a.m. Some of the features of this event are: Indoor and outdoor vendors and private "tailgating" sales, seminars, lectures, demonstrations, VE exams. For VE info call N1JEO at (203) 235-6932. General admission is \$6, children under 12 \$3. This year the special guest speaker will be Wayne Green W2NSD speaking on "The Day Kruschev Saved Amateur Radio." ARRL speakers include Betsy Doane K1EIC, CT Section Manager; and Tom Frenaye K1KI, New England ARRL Director. Information is available on the Web at [www.qsl.net/nutmeghamfest]. E-mail [nutmeghamfest@qsl.net]. Proceeds from the event will help support public service, scholarship and civic activities.

OCT 14

BREMERTON, WA The North Kitsap ARC will sponsor a Hamfest at President's Hall, Kitsap County Fairgrounds, NW corner of Fairgrounds Rd., at Nels Nelson Rd. Talk-in on 146.62(-) PL 103.5(-), WWRA rpt., or 146.52 simplex. Admission \$5, 12 and under 12 free. New and used equipment. Tables \$15 each, includes 1 free admission, until 9/30/00; \$20 each afterwards. Helpers to renters of personal tables (2 max.), \$4 each. Commercial spaces \$30 each. Electrical connection \$2 per table. Contact Marcie Stilwell KC7DAT, P.O. Box 2268, Silverdale WA 98383-2268. Tel. (360) 697-2797, or E-mail [nkarc@yahoo.com]. Info available at [www.silverlinkg.net/nkarc].

TAMPA, FL "Ham/Computer Fest 2000" will be presented by Egypt (Shrine) Temple ARA, at 4050 Dana Shores Dr., in Tampa. The location is Due West of the Tampa International Airport. Doors open 8 a.m.-5 p.m. Admission \$5 in advance, \$6 at the door. 8 ft. tables \$15 each. Tailgating space \$15. Everyone must have an admission ticket. Setup starts Oct.

13th after 1700 hrs. VE exams, all classes, by MOSI ARC, at 1300 hrs. There will be forums every hour starting at 9 a.m. Free parking, handicap accessible. Talk-in on 146.940. Contact Jay Strom at (727) 822-9107; or [K9BSL@juno.com].

OCT 15

KALAMAZOO, MI The 18th Annual Kalamazoo Hamfest will be held Oct. 15th at the Kalamazoo County Fairgrounds. Vendor setup at 6 a.m. Doors open to the public at 8 a.m. Advance tickets \$3, \$4 at the door. Trunk sales \$5. For tickets/tables, send SASE to Charlie Burgstahler, 6658 Carlisle Dr., Kalamazoo MI 49001. For further info, fire up the modem and take a peek at [www.qsl.net/ka8blo/hamfest.html], or E-mail [charlieb@net-link.net].

QUEENS, NY The Hall of Science ARC Hamfest will be held at the New York Hall of Science parking lot, Flushing Meadow Corona Park, 47-01 111th St., Queens NY. Vendor setup at 7:30 a.m. Buyers admitted at 9 a.m. Free parking. VE exams at 10 a.m. Admission by donation — buyers \$5, sellers \$10 per space. Talk-in on 444.200 rpt., PL 136.5, 146.52 simplex. For further info, call at night only: Stephen Greenbaum WB2KDG (718) 898-5599; E-mail [WB2KDG@Bigfoot.com]; or Andy Borrok N2TZX, (718) 291-2561, E-mail [N2TZX@webspan.net]. VE info only, Lenny Menna W2LJM, (718) 323-3464; E-mail [LMenna6568@aol.com].

OCT 21

GRAY, TN The 20th Annual TriCities Hamfest will be held on Saturday, Oct. 21st, at the Appalachian Fair Grounds, located off I-181 in Gray TN. A large drive-in indoor and outdoor flea market space is available. RV hookups. Admission \$5. The hamfest is being sponsored by the Kingsport, Bristol, and Johnson City Radio Clubs. Mail inquiries to P.O. Box 3682 CRS, Johnson City TN 37602.

RICKREALL, OR The Mid-Valley ARES is proud to present its 6th Annual Swap-Toberfest, Amateur Radio Emergency Services Convention. The convention will be held Saturday, Oct. 21st, at the Polk County Fairgrounds in Rickreall. Doors will be open

Continued on page 42

CALENDAR EVENTS

continued from page 41

for the convention from 9 a.m. to 3:30 p.m. Swap table setup will be from 6 p.m.-8 p.m., Friday night, Oct. 20th, and on Saturday morning, Oct. 21st, at 7 a.m. Self-contained RV spaces available. Talk-in on the 146.86 rptr. Features include: Swap tables, commercial dealers, meetings and seminars. Additionally, emergency communications vehicles will be on display from Marion and Polk County Emergency Management, Civil Air Patrol, American Red Cross, the Oregon State Police, and others as available. For more info, contact Bud Smith WA7FJF, (503) 838-0266, or E-mail to [wa7fjf@arrl.net]. To download a copy of the flyer and pre-registration form, surf the net for [http://www.teleport.com/~n7itf/swaptobe.htm].

WATERFORD, CT An auction will be held by the Tri-City ARC, Oct. 21st, starting at 10 a.m., at the Senior Citizens Center, Waterford Municipal Complex, Route 85, south of Exit 77 off I-395, or north of Exit 82 off I-95. Setup at 9 a.m. Handicapped accessible. Bring your items to be auctioned. Talk-in on 146.97. For more info, contact Austin J. Wolfe AA1SV at (860) 443-2459; or at [aa1sv@downcity.net].

OCT 22

SELLERSVILLE, PA A Hamfest, sponsored by the RH Hill ARC, will be held Oct. 22nd at Sellersville Fire House, Rt. 152, 5 miles south of Quakertown, and 8 miles north of Montgomeryville. Talk-in on 145.31. VE exams 10 a.m.-1 p.m., all classes. Bring documents. Indoor spaces \$12 (table included), outdoor \$6, bring tables; admission \$5. Hamfest Hotline: Linda Erdman, 2220 Hill Rd., Perkiomenville PA 18074; tel. (215) 679-5764. Web site [HTTP://WWW.RFHILL.AMPR.ORG].

OCT 28, 29

UMATILLA, FL The Lake ARA will hold its Hamfest and Computer Show at Olde Mill Stream RV Resort, 1000 N. Central Ave., Umatilla FL; tel. (352) 669-3141. 40 ft. x 60 ft. RV lots available @ \$18 per night, with utilities. Admission \$5 per person. VE exams, walk-ins only, at 10 a.m. Talk-in on 147.255. Inside tables \$10, includes one admission ticket. Tailgating \$7 per vendor. Contact Chuck Crittenden KE4EXM, P.O. Box 615, Altoona FL 32702; tel. (352) 669-2075, E-mail [capias@gate.net].

OCT 27, 28, 29

PORTLAND, ME The 18th AMSAT-NA Space Symposium and Annual Meeting will be held at the Holiday Inn Portland West, 81 Riverside St., Portland ME, Oct. 27-29. Tel. (207) 774-5601, 800 HOLIDAY, Fax (207) 774-2103. Convention rate: \$78 per night, reference AMSAT Convention when making reservation.

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Holiday Inn courtesy shuttle available from airport to hotel. US Air is offering a discount fare for the convention. AMSAT's Gold File #73171596 must be referenced when making reservations. US Air (800) 428-4355, or call AMSAT's travel agent, Jim O'Neil at (800) 322-7032 ext 151. Advance registration after Sept. 15th is \$30, at the door \$35. Saturday Night Banquet \$25. Make checks payable to AMSAT-NA in \$US. Send to AMSAT, 850 Sligo Ave. #600, Silver Spring MD 20910-4703. For further info, tel. (301) 589-6062; Fax (301) 608-3410; E-mail [martha@amsat.org].

OCT 29

CANTON, OH The Massillon ARC will present their 40th Annual Hamfest at Stark County Fair Grounds, all indoors and heated. Setup at 6 a.m. Doors open at 8 a.m. Take I-77 to downtown Canton, then follow W Tusc. or 4th St. west to the Fair Grounds. Talk-in on 147.18(+) Club rptr. Tickets \$4 in advance, \$5 at the door. 8 ft. tables \$10 with electric. Mail requests for tables to Terry Russ N8ATZ, 3420 Briardale Cr., Massillon OH 44646; tel. (330) 837-3091; or E-mail [MARC.HAMCLUB@JUNO.COM]. Visit the Web site at [WWW.QSL.NET/W8NP]. An auction will begin at 10 a.m. 15% commission charged on all items sold. You may buy back your own articles at no charge. MARC has the right to limit the amount or type of items sold at auction.

NOV 4

LONDONDERRY, NH The Interstate Repeater Society ARC Annual Fall Flea Market will be held Nov. 4th at the Londonderry Lions Club on Mammoth Rd. Space is limited, so reserve it now. E-mail reservations to [Harold@neainc.com]; or call Paul at (603) 883-3308. This event will be held rain or shine. There will be over 35 tables inside, and room for more undercover outside. Electricity is available to 13 of the 35 tables. \$2 discount to the first 10 people to provide their own table. After that it is \$10 per supplied table. Vendor setup is at 6 a.m. Early bird shoppers will be admitted 6 a.m. to 8 a.m. for \$10. Admission 8 a.m.-1 p.m. is \$3 each. Directions: Route 93 North to Exit 4 in NH. Top off the ramp left turn. Straight west on Route 102 until you pass Dunkin Donuts on the left, next light is Route 128, turn right. The Londonderry Lions Club is about a mile on the right. Talk-in on 146.850.

NOV 4-5

ODESSA, TX The West Texas ARC will host its "2000 Hamfest" on Saturday and Sunday, Nov. 4-5, at the Ector County Coliseum, 42nd and Andrews Hwy., in Building D. The hamfest will run 8 a.m.-5 p.m. both days. VE exams will be available. Free parking. Admission is \$3; tables \$10 each, with one free ticket per vendor. Contact Craig Martindale W5BU, 1719 Rosewood, Odessa TX 79761; tel. (915) 366-4521; E-mail [w5bu@hotmail.com].

NOV 5

MT. JOY, IA The 29th Annual Davenport Radio Club Hamfest/Computer Show will be held Nov. 5th at the Iowa National Guard Hangar, at the Mt. Joy Airport. Space is being planned for over 250 tables. Commercial vendors. Everything from parts to complete stations. Computer hardware and software. FSTV demo. No tailgating. No food or drinks may be sold. All tables must be rented through the club; bring your own chairs. Talk-in on 146.88/28 alt 146.64/.04, no PL. Tickets are \$5 in advance, with double prize stubs, and \$6 at the door with one prize stub. Free parking. Under 14 admitted free. Lots of prizes. You need not be present to win. Hours are Sunday from 8 a.m. to 2 p.m. Main prize drawing at 1 p.m. Setup on Saturday from 12 p.m.-5 p.m. Sunday setup 6 a.m.-8 a.m. Advance tickets via mail only: Bill Bolton WB0BBM, 28755 Utica Ridge Rd., Long Grove IA 52756; E-mail [gemobile1@aol.com]. For tables and tickets, contact Dave Mayfield W9WRL, 1819 7th St., Moline IL 61265; or E-mail [hamfest@gw1td.com]. Tel. Saturdays, 9 a.m.-1 p.m. (309) 762-6010 and ask for Dave. Fax (309) 757-1880. When sending mail, include a business size SASE and make checks payable to Davenport Radio Amateur Club, or DRAC. Tables are \$12 each. If you need electricity, add \$1; first come first served.

NOV 11

GOLDEN, CO The 2000 Rocky Mountain Radio League, Inc. Hamfest will be held 8 a.m.-2 p.m. at Jefferson County Fairgrounds, 15200 W. 6th Ave., in Golden. Take the Indiana exit from 6th Ave. Talk-in on 144.62/145.22 MHz. Admission \$4 per person; tables \$10 in advance or at the door. VE exams, ARRL forum, refreshments, door prizes. Contact Ron Rose N0MQJ, (303) 985-8692, or E-mail [n0mqj@arrl.net].

MONTGOMERY, AL The Montgomery ARC will host the 23rd annual Montgomery Hamfest and Computer Show in Garrett Coliseum at the South Alabama State Fair grounds, located on Federal Drive in the northeastern section of historic Montgomery. Talk-in on 146.24/.84, W4AP. Ragchew on 146.32/.92 (with phone patch *up/#down), 147.78/.18, 449.50/444.50. Flea market reservations required to assure table. Tailgaters welcome, \$5 per vehicle space. For more info, write to Hamfest Committee, c/o 2141 Edinburgh Dr., Montgomery AL 36116-1313; or phone Phil at (334) 272-7980 after 5 p.m. CST. E-mail [k4ozn@arrl.net]. Visit the Web site for late breaking news and events, [http://jschool.troy.edu/~w4ap/]. Admission \$5; free parking. Inside flea market setup 3-8 p.m. Friday evening, Nov. 10th, and 6-8 a.m. Nov. 11th. Doors open to the public 9 a.m.-3 p.m. CST. VE exams

Continued on page 59

Murphy's Law and Disaster Services

If there's one time when Murphy's Law will reign supreme, it will be during the management of an emergency by ham radio operators. While most hams are ready, willing, and able to grab a radio or two and head for the action, there is no guarantee that things will go smoothly. In fact, the smart money is that anything that can go wrong will, and will do so at the worst possible moment.

How can this be possible? Well, one of the companions to Murphy's law is the Six P Rule which states that "Prior Planning Prevents Poor Performance." (I know that's only five Ps, but we hams, after all, must always behave as ladies and gentlemen.) These two issues are the reasons that emergency and disaster communications can be so complex and challenging. The basic reason is that although we expect amateur radio communication to be similar to our day-to-day operations, it bears little, if any, resemblance. In fact, it is the very fact that there is the illusion of similarity that makes it so challenging. Planning, very effective planning, is critical to our success during an emergency.

"What could be so different?" I hear people ask. "We use the same radio in the same way that we do every day." Well, actually the physical environment may in fact be quite different from that to which we are accustomed. We realize that instead of being in our own ham shack, we can expect to be located in some foreign area. It may be the on-scene command station, or the weather bureau. It may be the local police department or a shelter for evacuees. What challenges do these types of facilities offer? If they are set up for emergency operations, they should just naturally work out well.

It is important to remember that some facilities are intended for and designed to provide a place for communications. Others have a different primary duty and are pressed into such service only on rare occasions. This is what may create some significant problems. A commercial structure, for example, probably has significantly more steel in its construction and offers greater shielding against both transmitted and received radio signals. In Florida, with hurricanes being such a threat, many buildings that lend themselves to use as shelters,

etc., have metal shutters that are closed over the windows for protection. This provides a very effective Faraday shield, and radio operations may be almost impossible to maintain.

At home, I have several 2-meter rigs with external antennas and battery backup capability. I can hit most of my favorite repeaters with a handheld from at least one location within the house even if it takes a telescoping five-eighths-wave antenna. On the other hand, making a contact from within a closed shelter may be far more challenging.

At home, if my signal is a little weak, I can move to a better location for a better signal. In a disaster, someone may select the operating position for the amateur operator without any knowledge of radio requirements. The incident commander or the public service official will need to keep his or her communicator readily available and convenient to other resources and isn't concerned about the ham operator's needs. While we may think it's okay to run outside or up onto the roof to get a solid signal, others may perceive popping in and out of the area to be downright counterproductive.

The next great difference is the fact that in most phases of our hobby we are in "CQ" mode. This means that we are usually willing to communicate with any (or at least almost any) other ham who happens to be on frequency. During emergency communications, however, it is imperative that we are able to get a message to the intended recipient. This may require the ability to effectively contact a particular repeater rather than merely being able to hit the most accessible one. While relays are possible, every relay takes at least one additional operator away from some other possible duty, so it shouldn't be our first choice.

So, what do we need to do to minimize Murphy's hold on our efforts? First and

foremost, as mentioned earlier, we need to emphasize planning. It is critical to know who needs support where, and what the expectations are. As I've mentioned many times before, the next steps include identifying people who will be assigned to the various locations, and then ensuring that through nets, simulated emergencies, drills, etc., people practice what they will be called upon to do. Obviously, though, there's a piece missing — the equipment aspect.

It is true that we hams tend to have a fixation on our equipment. And, of course, every ham keeps a ready bag that has those supplies he or she will need in the event of an emergency. On the other hand, though, this tends to focus on a "one size fits all" mentality. Working in various hospitals for nearly thirty years has exposed (excuse the pun) me to the ultimate proof that such a focus doesn't work. If you've ever been afforded the opportunity to wear a hospital gown, you know that it can better be described as "one size fits nobody." While better than nothing by far, the equipment we take to an emergency may or may not work and probably will not be the optimal solution.

During storm warnings, people are advised to take shelter in an interior room away from windows. The very attributes that make a room safer during a storm also make the room less desirable as an operating location. Guess what kinds of rooms are usually selected to be used for shelters? Yep — internal rooms away from windows. A J-pole antenna made from 300-ohm twinlead is a great part of the emergency kit, and often will perform very well. Unfortunately, in the inner reaches of a commercial building, tapping the venerable J-pole to the wall may not work any better than a rubber ducky.

Continued on page 61

HOMING IN

Radio Direction Finding

Joe Moell P.E. KØØV

P.O. Box 2508

Fullerton CA 92837

[Homingin@aol.com]

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USA Foxhunting Championships 2001 — Let's Start Planning Now!

Does your ham club enjoy putting on hamfests and conventions? Do the members like to host visiting DXers? Are you looking for a new club activity that can involve every member and build lasting friendships, both locally and around the world? If so, I have an idea for you.

I am seeking one or more clubs to organize and host the first-ever USA ARDF Championships of on-foot foxhunting, to take place about a year from now. If your club is already active in international-style foxhunting (also called foxtailing, foxteering, radio-orienteering and ARDF), you already know how it promotes technical skills, builds physical ability, and fosters camaraderie. Putting on large-scale radio-orienteering events can add even more excitement. Read on, and you'll see that it's something that any well-organized club can do. But first, a little background.

In many European and Asian nations, there is an annual cycle of ARDF competitions, as

prescribed by the International Amateur Radio Union (IARU). Local events take place throughout each participating country in the spring and early summer. Later in the summer, qualifying rounds are held in various regions of each country, followed by national championships. For instance, Deutscher Amateur Radio Club held the German ARDF Championships August 11-13 near Berlin.

After that, the national champions in each age/gender division travel to international competitions. In even-numbered years, it's the World Championships. This year, they are in Nanjing, China, from October 13th through 18th. Slovakian hams will host

them in 2002. In odd-numbered years, multination championships are held at the IARU Regional level. For example, next year's Region 1 (Europe and Africa) championships will be in France.

IARU Region 2 (North and South America) joined the international competition cycle for the first time last year. Prior to that, our involvement had been only as guests and visitors. It began when Kevin Kelly N6QAB represented USA at the Region 3 (Asia and Oceania) ARDF Championships in Townsville, Australia, four years ago.

In 1998, six USA hams (WB6BYU, KC7CGK, KE6HTS, KF6YKN, KE6OTF, and WB6OBB) formed the first USA team to travel to the ARDF World Championships, which were in Hungary that year. WB6BYU and other members of the Friendship Amateur Radio Society (FARS) then hosted the first-ever IARU Region 2 ARDF Championships in Portland, Oregon, during August 1999 (**Photo A**). "Homing In" for January 1999 described the 1998 World Championships and my October 1999 column covered the Region 2 event.

It wouldn't have been a "Region 2 Championships" in 1999 without at least two teams from the region competing. As of this writing, only USA and Canada have active ARDF programs in Region 2. (Know any hams in Central and South America? Encourage them to try it!) A team of five foxtailers from the Victoria, BC, area represented their country last year. They were led by Perry Creighton VA7PC, who is ARDF Coordinator for Radio Amateurs of Canada.

Based on lots of E-mail correspondence



Photo A. Group photo of the 1999 Championships participants in Portland in front of the dining hall. All had a great time, thanks to efforts of the organizers, sponsors, and volunteers.

in recent months, it's uncertain if the Canadian ARDFers will travel to compete outside their country in 2001. That's why the current plan is to have the first USA National ARDF Championships next year. If it turns out that Canada or other Western Hemisphere country (or countries) can field a team at that time, we'll petition IARU to sanction the event as the IARU Region 2 Championships, in addition.

It is an IARU tradition, expressed in the official rules, that foreign radio-orientees are welcome to compete at national championships, and out-of-region radio-orientees are sought at regional championships. These visitors compete as individuals, not in national teams. That's why Kevin N6QAB received a hearty welcome at the Region 3 Championships, where he joined a field made up of the region's teams from China, Korea, Japan, New Zealand, and Australia, plus visitors from Kazakhstan, Bulgaria, and Poland.

The Portland event last year drew ARDFers from Australia, Sweden, Russia, Japan, Bulgaria, Belgium, and Kazakhstan. Some of them were the best in their respective countries at the sport, so we learned a great deal from them. For instance, Panayot Danev LZ1US of Bulgaria and Rik Strobbe ON7YD of Belgium gave classes on the fine points of on-foot RDF and orienteering to all attendees. Rik, who has served as Interim Chair of the IARU Working Group in Region 1, also presented a session on organizing ARDF Championships and serving as judges thereof. According to Rik, quite a few European foxtailers are eager to come to the next large ARDF event in the USA.

Choose your forest

FARS-USA's home in Portland is an excellent location for ARDF. IARU's rules for ARDF Championships (available for download via link from the "Homing In" Web site) call for mostly wooded terrain with no more than 200 meters' elevation change on the course. A forest with a good trail system is best. Experienced ARDFers like to run cross-country instead of staying on the trails. In many places that's possible, although there are dense forests where it is very difficult to do.

IARU mandates that separate 2-meter and 80-meter competitions are to be held on separate days. They should be at different sites, or in different parts of a single large site. The Pacific Northwest has an abundance of outstanding possibilities. Other areas of the country, such as the woods of the northeast, the Appalachian Mountains, and the moss-covered trees of the south are quite good.

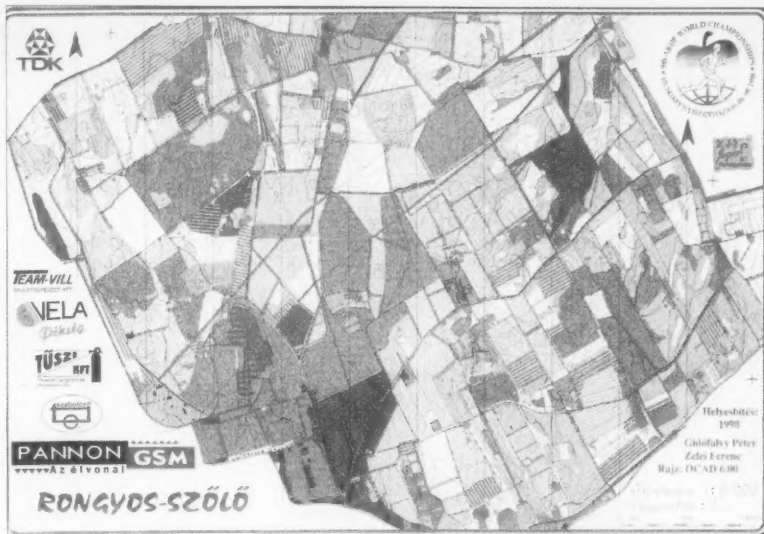


Photo B. Official map of one site at the 1998 ARDF World Championships in Hungary. Actual size of this multicolor map is 11 x 16 inches. Start (triangle symbol) is in lower left. Finish (bull's-eye circle) is near the center.

Even mountainous parts of desert-states like Arizona and New Mexico have suitable radio-orienting sites. The entire location doesn't have to be forested. Sometimes portions of championships courses include farmland or open grass. Every state probably has at least one site where an IARU ARDF event could be held.

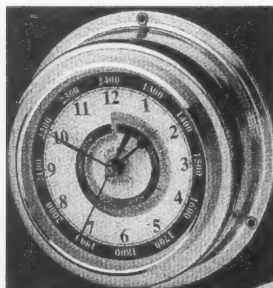
The five fox transmitters must be more than 400 meters apart and at least 750 meters from the start. Straight line distance from start to each fox and to the finish should be five to ten kilometers. Depending on the skill of the hunters, you can use the terrain to add difficulty. On two meters, hills, water tanks, and other large features cause nondirect signal paths and erroneous bearings. This isn't true on 80 meters, so consider putting foxes near a lake or other large impassable terrain feature so the hunters must decide which way to approach to minimize their travel distance.

Site selection and course planning is a very important task, with many factors to consider besides terrain. For instance:

(1) Is this type of activity permitted at

the site? Make sure that off-trail running is OK. Secure permits, if needed, well in advance. If possible, make sure that other large groups won't be using the site at the same time. You may have to show evidence of insurance and specifically indemnify the site and its owners. I have found that obtaining permission isn't difficult if I hasten to point out that this is not a commercial venture, that we are not charging admission to spectators nor putting any area off-limits to others, and that we won't have any loud music.

(2) Are there any off-limits areas at the site, such as meadows with endangered plants? There are stables in one of our practice sites



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10	BRYAN ACKERLY	OTM	AUS	4	98.38	
11	PANAYOT DANEV	OTM	BUL	4	100.00	
13	JOHN MACCOMACHIO	OTM	CAN	4	100.00	
14	RICK WILLIAMS	OTM	CAN	4	100.00	
15	JOE YOUNG	OTM	CAN	4	100.00	
16	ALEXANDR KODIEREN	OTM	RUS	2	101.38	
17	MYKHAIL MARTYNYUK	OTM	RUS	2	101.38	
18	TEGENY STAVITSKY	OTM	USA	4	101.38	
19	DICK ARNETT	OTM	USA	4	101.38	
20	JERRY BOYD	OTM	USA	4	101.38	
21	BOB COOLEY	OTM	USA	4	101.38	
22	ROBERT FREY	OTM	USA	4	101.38	
23	MARVIN JOHNSTON	OTM	USA	4	101.38	
24	HARLEY LEACH	OTM	USA	4	101.38	
25	MIKE PEDDICOR	OTM	USA	4	101.38	

Photo C. Posting the results in near-real time is a nice touch, if you have sufficient volunteers to do it.

that hunters are told to avoid. The horse owners insist that our shiny RDF gear will scare their animals.

(3) Where will start and finish be? Putting them about 300 feet apart, as was done in Portland, eases the burden on organizers and staff because it's easy to move everything from one to the other as the hunt progresses. On the other hand, putting them at opposite ends of the site, as is typically done at European championships (see

Photo B), makes for a more challenging course. In the latter case, a foxtailer who misses a transmitter near the start must do considerable backtracking to pick it up if he/she discovers it near the finish. That's not true in the former case.

(4) Are both start and finish areas accessible by road with plenty of parking? Since you'll want to set up sun/rain shelters, water, first aid station, and so forth in both places, it shouldn't be necessary to carry supplies a long way.

(5) Good maps are a must. Many European foxhunting champions are also skilled orienteers, insisting on detailed topographical maps with contour lines at 20-foot elevation intervals. It may be possible to create suitable ones using USGS data from the Internet. Computer programs such as OCAD can also be used.

Maps are not given to the hunters until just before the hunt starts. It is also best if the site is not disclosed until the day of the event. This prevents competitors from trying to gain an unfair advantage by scouting it out, and it minimizes the likelihood that hiders will be observed while setting out the foxes.

Fox transmitters should be unattended. To prove that they found the transmitters, competitors carry a card that they mark with a unique punch at each one. Punches have distinctive patterns with up to nine pins. Standard punches and cards used by orienteers are suitable. Electronic systems that record the time of arrival at each fox have been introduced in Europe, but they aren't mandatory because the foxes can be found in any order.



Photo D. Don't forget first aid! Have supplies and at least one trained person on hand. Jackie Schaffer WA6AKP is treating a finisher at a recent southern California foxhunt.

International rules are very strict about timing of the five transmitters. Championship course foxes are on-air for exactly 60 seconds each in numbered sequence, all on exactly the same frequency. There's no dead air time between fox transmissions and no overlapping of transmissions.

To meet these requirements, you need a set of identical high-stability timers, one per fox. Two inexpensive devices, the Montreal Fox Controller and PicCon, make it possible to use almost any two-meter FM handie-talkie or mobile rig, plus a heavy-duty battery, as a radio fox. Check the "Homing In" Web site or contact me for more information on them. You'll also need a sixth transmitter on another frequency, for a finish-line beacon.

Most first-time foxhunt organizers worry most about obtaining the properly timed transmitters. They're indispensable, of course, but they may be readily available for loan from a local ham or someone who will be attending. If you need to make your own, check the March and April 1998 issues of 73 to get "Homing In" ideas for reliable, inexpensive two-meter foxboxes. An 80-meter fox project is coming soon to this magazine.

Hotel or dorm?

When ARDF enthusiasts converge from many countries, it's important to have them stay close together and interact on a continuous basis to form lasting friendships. The cost of lodging and food must be low to make the event attractive to those traveling great distances, and especially to young competitors of modest means. Hotel accommodations are acceptable, but only if the price is right. Attendees at the 2000 ARDF World Championships in China are staying at the New Century Hotel in Nanjing, where IARU's negotiated rate is just US \$30 per person, double occupancy, including meals.

The most cost-effective accommodations are usually at schools and colleges. As an example, the 1998 World Championships were headquartered at a teachers' institute. For the 1999 Oregon event, FARS-Portland arranged for use of the dormitories and food services of Reed College, on its beautiful campus near downtown Portland. The rolling green lawns made ideal practice sites for ARDF during the get-acquainted time before the 80-meter and 2-meter competitions.

Here's a typical schedule for an International Championships:

Day 1 (afternoon): arrival, registration, orientation.

Day 2: training, practice, instructions, jury meetings, and order-of-start drawings.



Photo E. IARU rules call for a contestant to run through a corridor to get to the finish line. This one was at the 2-meter event in Portland. Note the banner, courtesy of the local orienteering club. After finishing, they went inside to dry their shoes and socks around the fireplace.



Photo F. Medals can be a significant expense, as you may need lots of them. Here are USA's Junior Division champions at Portland. Left to right are Brian Peddicord KF6DZN, Jack Loflin KC7CGK, and Jay Thompson W6JAY.

Day 3: 2 meter competition.

Day 4: sightseeing.

Day 5: 80 meter competition and closing banquet.

Day 6 (morning): departure.

Typically, there is a day of rest and sightseeing between the two band competitions. Some competitors may choose to arrive on Day 2, but it will probably be necessary to charge them the full amount anyway, depending on your negotiated arrangements with the housing provider.

Besides lodging and food, arrange for a meeting room and social area. Consider having a special event ham station for visitors to operate in free time. Internet access would be a big plus, as visitors will want to send E-mail to their families and friends at home. One or more of the organizers should stay on-site continuously for the duration of the championships to help visitors, interface with facility management, and supervise minors.

It's likely that the competition sites won't be close to where competitors will be eating and sleeping. You'll need to arrange bus or carpool transportation for each competition day. That ensures that everyone arrives at the site on time with no lost souls. Box lunches for these days are in order.

It takes a team of volunteers to put on a well-run foxhunt. Timers at the starting line send off the hunters at exact intervals. Helpers at the finish line collect the cards and mark finishing time on them. Things can get hectic at these two locations, so two persons are better than one. You'll also need volunteers for scoring (**Photo C**) and first aid (**Photo D**). Remember, these positions do not require licensed hams.

Have course marshals scattered in the woods to watch over the activities. Contestants know they may not help one another in any way nor vandalize the foxes, but having these observers helps prevent temptation. Marshals should also be on the lookout for any health problems that might develop during the hunt. Don't station them near foxes — that would be a giveaway. Have them keep moving along. Encourage them to carry cameras to document the fun.

IARU rules require start and finish corridors from 50 to 250 meters long. Competitors run into the start corridor when released by the start timers. When they reach the end, they may turn on their RDF gear and take off into the forest. Try to find a natural corridor with the end hidden by trees or a hill. Similarly, the ending corridor funnels runners to the finish line (**Photo E**). It's good to have a spotter at the entrance to the finish corridor to announce via radio (the 70 cm band is ideal) to those waiting that runners are approaching.

ARDF is an amateur sport, so no cash prizes can be offered at national or international championships. It's traditional to have first-, second-, and third-place medals in all divisions for the best individuals and national teams on each band (**Photo F**). IARU presently has five age/gender divisions, so up to 60 medals will be needed, depending on the number of participants that register in each division. Medals are presented at the closing banquet by a VIP of IARU or the host society (ARRL in the USA). Every participant should also receive a certificate and a small memento of the event.

Let's get started!

Selection of sites and arranging for housing are substantial undertakings, but you don't have to do them alone. Your local Chamber of Commerce or Convention/Visitor's Bureau may have good suggestions. The National Park Service and the forestry authorities in your state may be of assistance in site selection.

Get to know the leaders of your local orienteering club. They can probably supply the standard orange-and-white flags, stands, and unique punches for each fox, plus the competitor cards. They will also have excellent ideas for suitable well-mapped sites. They may even volunteer to assist with the event as course-setters, course marshals, and timers.

I have gotten excellent low-cost maps of sites in my area from the Los Angeles Orienteering Club. The Vic-Orienteers of British Columbia were instrumental in putting on the foxhunt for the 1993 Friendship Radiosport Games. Who knows — you might find some good ARDF prospects in your local O-club. In my area, the Caltech Orienteering Club holds annual radio-orienteering events on campus.

Sponsoring an international radio-orienteering event isn't a money-making venture, but it shouldn't deplete the club treasury either. Carefully consider all the costs, set a reasonable price, and announce it well in advance. The basic price should include all housing, food, site transportation, and incidentals for the duration of the event. I think it's best to include the closing

Continued on page 61

NEW PRODUCTS

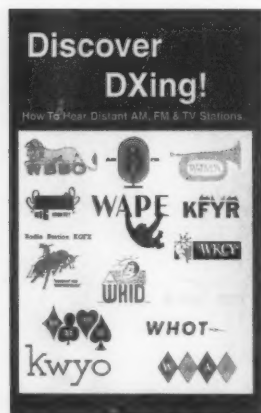
Mini-News from MJF

• The MFJ-269 SWR Analyzer covers 1.8 to 170 MHz and 415 to 470 MHz — an MFJ exclusive. Large, easy-to-read, two-line LCD display and side-by-side meters clearly display your information. Built-in Ni-Cad/Ni-MH charger circuit, battery saver, low battery warning, smooth reduction drive tuning. Use as a signal source for testing/alignment. MSRP = \$359.95.

• The RuffRider Tri-Bander, MFJ-1436, is 59 inches of stacked elements with high-Q phasing coils. 7.2 dB gain on 440, 4.5 dB gain on 2m, and 2.15 gain on 6m. Work all your favorite bands with one antenna! Factory-tuned for SWR less than 1.5:1 with 50 ohm impedance; handles 150W; 5 inch mag recommended. MSRP = \$79.95.

• MFJ's ATR-20 antenna tuner handles a full 1.2 kW SSB and 600W CW with load impedances from 25–800 ohms. Features include an accurate built-in 3 kW true peak or average detecting directional power meter. Peak and average forward power, reflected power, and SWR are displayed on an illuminated cross-needle meter. MSRP = \$459.

For further information on these or other MFJ products, contact MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; tel. 1 (800) 647-1800; fax (662) 323-6551; E-mail [mfj@mfjenterprises.com]; site [http://www.mfjenterprises.com].



BC DXing

A neat little 90-page book, *Discover DXing!* (by John Zondlo, second edition), arrived from Universal Radio. This has to do with listening for distant AM, FM, and TV stations, not pileups on 20m. With the strange propagation conditions associated with our sunspot maximum, you may have been having some fun listening to skipping in FM and TV signals.

The book lists the AM band clear channel allocations, and lists the stations. It also lists the TV stations on channels 2–13, where the skip is most likely. I know that Boston's channel 2 has recently been wiped out for me by a skipping station.

In my search for stations carrying the Coast-to-Coast AM program, I've found the book's list very handy.

If you have any kids, you might get them interested in BC station DXing.

The book shows pictures and discusses the most popular radios, discusses QSLing, how skip works, and so on.

It is \$5.95, plus \$2 s/h, from Universal Radio, 6830 Americana Parkway, Reynoldsburg OH 43068; tel. 1 (800) 431-3939; E-mail [dx@universal-radio.com]. — W2NSD/I.

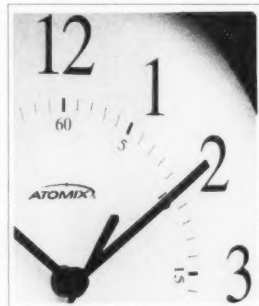


Elecraft K1 QRP Transceiver

As small as its original K2 predecessor, the new K1 runs up to 5W into two user-selected bands. LCD frequency readout displays output power, signal strength, supply voltage, keyer speed, and other information. Additional operating

features include push-button band selection, RIT and XIT, 8–50 wpm internal keying with message memory and autorepeat, and three crystal filter bandwidths. This kit can be ordered with any two of the following bands: 40, 30, 20, 15. MSRP = \$269; optional noise blander, \$29; tilt-stand, \$35.

For further information about Elecraft products, contact them at PO Box 69, Aptos CA 95001-0069; tel. (831) 662-8345; E-mail [eric@elecraft.com]; site [www.elecraft.com].



Atomix Clox

Atomix atomic clocks from Chaney Instrument Co. keep precise time guaranteed to a fraction of a second, and they never need to be reset. Just set

it and forget it. The clocks automatically reset themselves to the correct time, whether it's daylight savings or standard.

All Atomix clocks feature a special device that receives updates five times a day, via radio, from the official US Atomic Clock at the NIS in Boulder CO. There is also a deactivation device for states without daylight savings time.

Available at Wal-Mart or via selected mail-order catalogs, or contact Chaney Instrument Co. in Lake Geneva WI at 1 (800) 777-0565.

Original Swedish Keys

Morse Express has announced the availability of the original "Swedish Pump Key," in two versions, from Lennart Pettersson in Hoverberg, Sweden. According to owner Marshall Emm N1FN, the Swedish is one of the classic telegraph keys and is featured in all of the standard reference works.

"We were delighted to discover that it is still in production, and astounded to learn that there is a miniature version that is virtually unknown," Emm said.

Photos and more info on the Original Swedish (\$189.95) and the Miniature Swedish (\$249.95) are available at [www.MorseX.com], where you will also find secure ordering facilities. Or, contact Morse Express at 2460 S. Moline Way, Aurora CO 80014-3155; tel. 1 (800) 238-8205 or (303) 752-3382.

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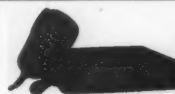
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Hamsats Portable-Style

Somewhere between the world of chasing amateur satellites from a street corner or the deck of a ship with a handie-talkie, and doing the same from home with a big rig and steerable multi-element beam antennas, exists the temporary but stationary terrestrial hamsat station.

This is the station that can be packed in a suitcase for a trip to a vacation cabin or a serious campout. It might also be appropriate for an apartment dweller or someone with a small attic (very little antenna space), and prohibitive deed restrictions that won't allow any outside antennas.

Rig choices

Picking a rig for stationary-portable work may be as easy as grabbing the main base rig and packing it up. The Yaesu FT-847 is a classic example of a do-everything HF/VHF/UHF all-mode transceiver that covers most bands from 160 meters to 70cm. It runs on 12 VDC, and thus it's great for battery operation or, with an additional power supply, works well from AC house power. It's just a bit too large to use as a mobile rig, but it's small enough to fit in a large briefcase, with room for accessories. This radio, and perhaps the new Kenwood satellite-

ready transceiver, also does well in apartments and motor homes.

Check out the FT-847 specifications at [<http://www.yaesu.com/ft847.html>]. The features offered provide a good benchmark for comparisons and tradeoffs. While the FT-847 does not cover 1.2 GHz, or have a built-in TNC (Terminal Node Controller) for digital communications, it has plenty of power, a sensitive front end (built-in preamp), and the necessary jacks to interface with external 1200 and 9600 baud TNCs.

If your home hamsat station is large and composed of multiple rigs, transverters, amplifiers, preamps, and other external boxes that are required to make contacts, then it's time to start shopping. If new radios are not in the budget, make plans based on modes that you can pursue with existing equipment. If you are new to satellite work, get a copy of *Working the Easy Sats* by Gary

B. Rogers WA4YMZ, from AMSAT (The Radio Amateur Satellite Corporation). The latest revision is dated April 2000, has 33 pages, and provides a solid introduction to the amateur satellite program, with excellent hints on how to work the more easily accessed hamsats. You can reach AMSAT on the Web at [<http://www.amsat.org>], or via phone at (301) 589-6062.

Antennas

When you have chosen a radio for your compact station, it's time to consider antennas. For the cruise-ship HT effort, a long whip or a dual-band, hand-held yagi does well when chasing the single-channel FM satellites like AO-27 (AMRAD-OSCAR-27) or UO-14 (UoSAT-OSCAR-14), but these antennas are not convenient for a more stationary operation. It would be nice to have directional antennas with a complete az-el (azimuth and elevation) rotator system, but it is usually not convenient to carry this much equipment. Rotors, control cables, and boxes take up a lot of space, and finding a place for the rotatable antennas may be a problem, but this might worth considering.

A small dual-band beam, like the Arrow II from Arrow Antenna (<http://members.aol.com/arrow146/index.html>) of Cheyenne WY, will outperform just about any omnidirectional two-meter or 70cm antenna for portable satellite work. If you can rig a compact rotator system for this usually hand-held antenna, it's a great performer. Most hams that have the Arrow II use it with a dual-band HT, but when used with separate radios for two meters and 70cm, the optional duplexer is not needed or preferred since it is limited to 10 watts on transmit. While Arrow has mounting hardware for rear-mounted stationary use, reworking the antenna for mounting at the balance point

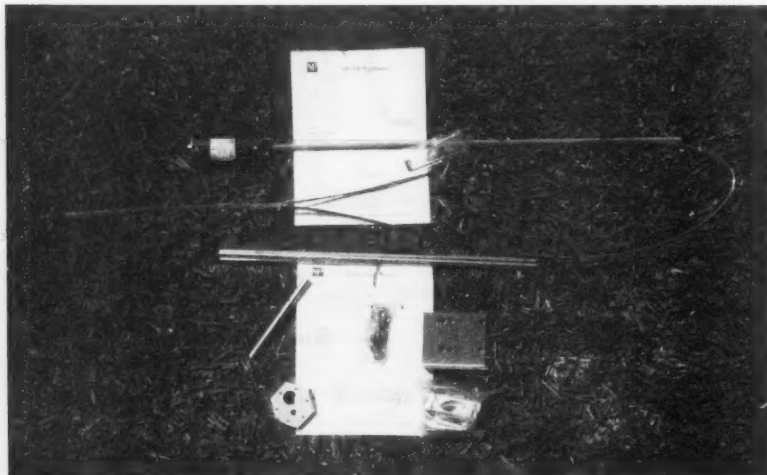


Photo A. The M-Squared EB-144 "Eggbeater" antenna with optional RK-2M radial kit and instruction sheets.



Photo B. John WA5WOD and Charlie K5ENG easily put together the two-meter "Eggbeater" while on a fishing trip.

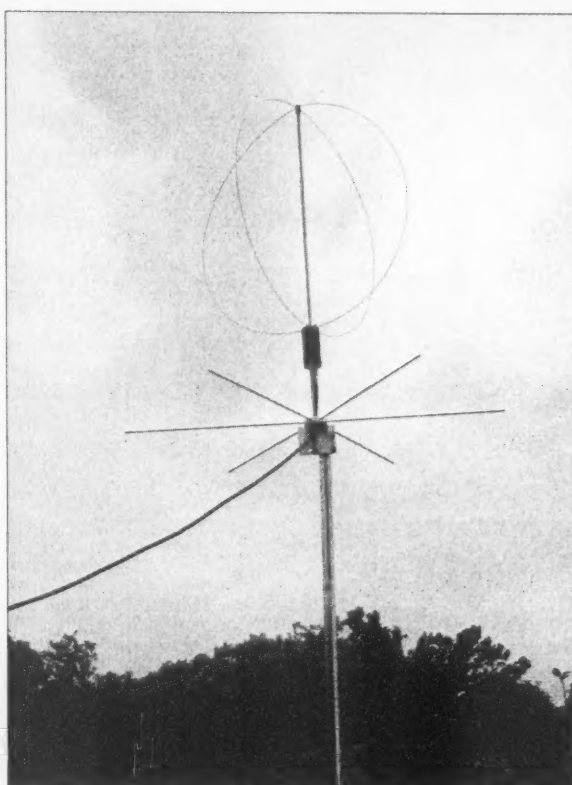


Photo C. The M-Squared EB-144 with radial kit on a pole and ready to go for some fishing-trip satellite contacts.

of the boom may be difficult, but would yield a very small turning radius for small-attic mounting. A whip antenna or ground plane is easy to pack and install, but the real advantage of these antennas is their ability to be oriented for best transmit and receive signals during a satellite pass. When used as a stationary antenna, the deep fades encountered make contacts difficult. This antenna is best left for the HT.

The true omnidirectional stationary antenna can provide a reasonable compromise between HT whip antennas and small beams. A good example is the "eggbeater" from M-Squared Antennas [<http://www.m2inc.com>]. They have a two-meter version (EB-144) and a 70cm version (EB-432). Both antennas exhibit horizontal polarization on the horizon, but overhead they have right-hand circular polarization. When used with the optional radial kits (RK-2M for two meters and RK-70CM for 70cm), the pattern is more hemispherical, with a circular lobe gain increase of 6 dB. The radial kit is designed for satellite work.

Both antennas will fit in limited spaces and can be used for almost any hamsat in the sky. They are not, however, designed to

be repeatedly assembled and disassembled. They are best used for the occasional trip or move. The loop elements are made from copperweld — copper over steel — and are rather stiff, but can be easily replaced if necessary. The 70cm version with radial kit retails for \$166, and the two-meter version with radial kit is \$177. The high prices are offset by the extremely durable components and quality construction, but can inspire antenna experimenters to build their own.

Due to the weak-signal nature of working AO-10 (AMSAT-OSCAR-10) with its high elliptical orbit, the best results with "eggbeaters" are found when the satellite is at or near its perigee, or orbital low point, when signals are strongest.

For 10-meter reception via RS-13, a simple dipole or inverted V antennas will do well, since most hams who pursue mode "A" (two meters up and 10 meters down) or mode "K" (15 meters up and 10 meters down) via the Russian RS-13 satellite use dipoles at home. A wire antenna is also very easy to pack and transport. For apartment dwellers, it can also be hidden by using fine wire and small diameter coaxial feedline.

Try it today

Small antennas may become the norm for contacts via Phase 3-D. But Phase 3-D won't be available for use immediately after launch. It may be several months before the transponders are available for general use. Start preparing now by trying new antennas and radio configurations via the current batch of low-Earth-orbit amateur satellites. You'll be glad you did!

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JAN Crystals

HW-8 Notes + QRP PSU

OHMAGOSH! October already! Yup, and before you know it, Year 2000 will be in the history books. 2000 has been a so-so year for me. I've spent most of my free time working on Heathkits, especially the HW-8 transceiver. I've picked up a few pointers and some other interesting stuff for you to use on your HW-8.

A few months ago, we talked about the HW-8 QRP transceiver. I've come upon some information about the final output transistor that you may find interesting.

Replacement PA transistors

Heathkit used a house-numbered part. But from the printing on the device, it looks like Motorola made the transistor. I can't find a cross-reference for the Heath number anywhere. However, the instruction manual for the HW-8 references the part to a 2N4427. Mouser Electronics stocks this transistor. It's about \$3 a pop. You can use an NTE replacement, but the NTE part is much more money.

In my "HW-8 Handbook," a high power modification for the HW-8 is as simple as subbing in an ECG488 for the final. I found the ECG replacement guide on the Internet. They list the ECG488, but it's not the high power device I wanted. However, an NTE replacement part crosses the ECG488 to a NTE488. I have not yet tried this in my HW-8s. I did notice that NTE crosses the 2N4427 to a 15 watt RF device in a TO-5 case. The

NTE488 comes in at a 5 watt RF device in a TO-5 case. I don't know why the difference between the two. I guess I will have to experiment with some in one of my radios.

I have had luck with the 2N3553 and the 2SC799. Both will produce a good watt and a half on 80 and 40 meters. On 20 and 15, the max power seems to be about one watt.

Don't use a 2N3866 unless you just have to. This device loves to operate up into the 450 MHz band. It will do so all by itself without any help from you. Usually, the 2N3866 is short-lived in an HW-8. The transistor will take off and go into thermal runaway.

In some of the HW-8s I have come across, I have put in MSPA20 in Q8 and Q5 locations. They seem to have a bit more bite than the original Heath-kit devices. Although I have not tried them, a metal case 2N2222A might work also as Q5 and Q8.

There are two other locations you should look at if you are having trouble with the HW-8's output. Check the zener diode at location ZD2. If this diode has become leaky, it may be the cause of low output. This diode is there to protect the final, Q9, from excessive high collector RF voltages. This happens if you key the transmitter into an open antenna. Any RF voltage over 36 volts will be clamped to ground via the zener diode.

If your HW-8 has been repaired in the past, especially with final PA troubles, look to see if a ferrite bead is on the base lead of Q9. This bead is there to keep Q9 stable. If your transmitter seems to take on a life of its own, check for this bead on Q9's base.

Improved trimmer adjustment

On 20 and 15 meters, you'll often find that the trimmer capacitors in the tank circuit

require tightening all the way down. There's not enough capacitance from the trimmer to get the stage to resonate. Take a 10 or 20 pF capacitor and tack solder it across the trimmer that is giving you trouble. Then try the adjustment one more time. With the extra capacitance across the trimmer, you should now find the circuit peaks without twisting the screw out of the trimmer threads. By the way, this fix works for the front-end trimmers as well.

Main dial fixes

Since the HW-8 is almost 25 years old, the vernier drive for the main tuning may have dried out. If it has, then you risk twisting the VFO capacitor apart if you tune into either end stop. Fixing the VFO capacitor is harder than a bag full of jawbreakers! The best fix is to not rip out the VFO plates in the first place. To keep this from happening, you should remove the vernier drive and relube it. The drive comes apart, but you first have to remove it from the HW-8's chassis. Once its out and in your hands, you can see how it unscrews. There's a set of ball bearings inside, so watch out you don't lose them when the two ends are removed.

Use some solvent to remove the old grease and other gunk that lives inside the drive. Then repack the drive with some bicycle grease. This stuff won't ooze out and won't dry out either. Cheap, too! Once you have reassembled the drive, install it back into the HW-8. You'll be rewarded with a smooth-turning VFO again.

A QRP power supply for a QRP transceiver

I've shown this circuit before, but still get requests for a small, simple power supply to operate QRP transceivers from. It's a classic!

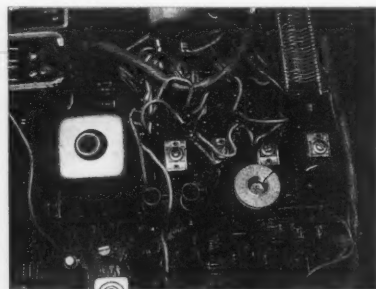
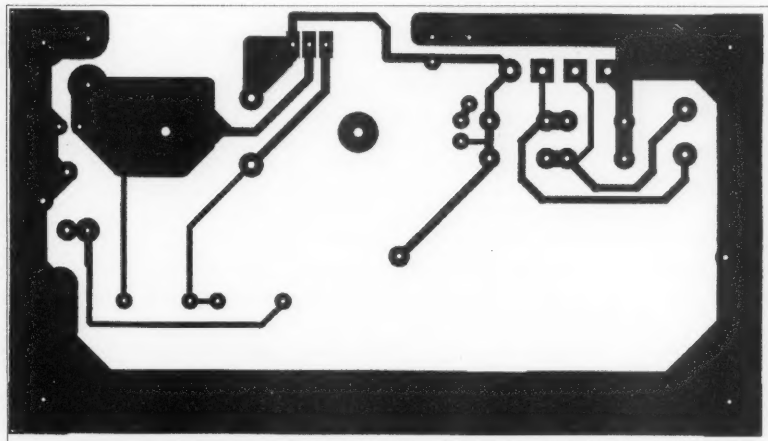
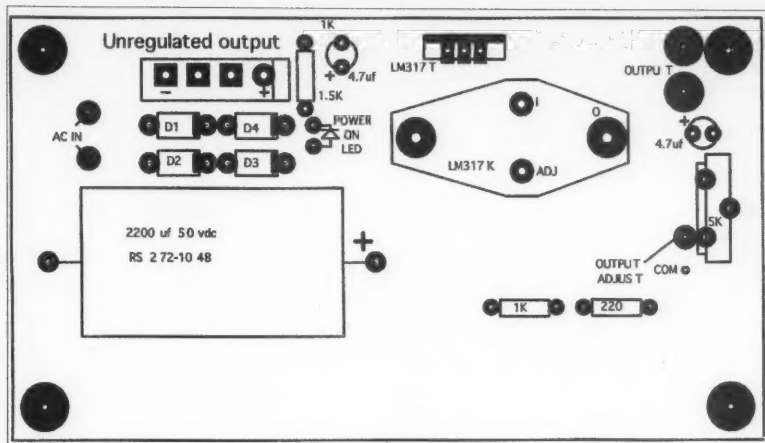


Photo A. Inside the HW-8. The final transistor is wearing the large heat sink. The transmit trimmers are in the background.



The entire circuit revolves around an LM317 adjustable regulator. In the TO-3 case, the device will handle up to 1.5 amps. That's more than enough power for even the most QRO QRP rigs.

I used a junk box transformer, and just

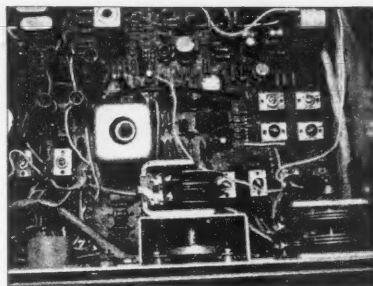


Photo C. The main VFO capacitor is just behind the VFO coil. The trimmers to the right of the VFO are for the receiver front end.

Since the LM317 is adjustable, we may as well place this control on the front panel of our supply. If not, then a small trimmer can be used.

There's a chance you might want to use this little guy as a constant voltage battery charger. If you do, then I've added a small three-amp silicon diode in the output lead. This diode will prevent the battery from discharging into the regulator if the main power has been turned off.

An LED for a “power on” indicator is thrown in just to let you know that the power supply is in fact on.

Building the QRP supply

This is such a simple project, point-to-point construction would work just fine. The use of terminal strips and tie strip would be all you need. Use a small aluminum chassis to hold everything. The LM317 needs to be heat-sinked, so use the aluminum chassis and a TO-3 insulator kit to mount the LM317.

Use your digital VOM and set the output voltage with the trimmer or panel-mounted pot. Add some five-way binding posts and you're done!

Next month, I'll look at the Heathkit HW-9 QRP rig. It's been a while since we took a look inside this guy. **73**

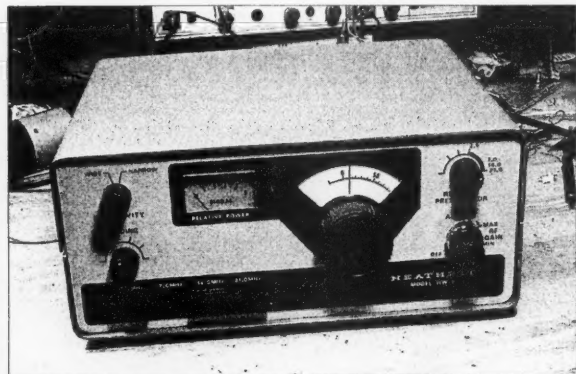


Photo B. Another HW-8 makes its way to the service bench.

about any thing in your junk box will work. However, don't use a transformer with a secondary higher than 18 volts unloaded. The regulator must drop any excess voltage and will run much hotter than needed. A 24-volt secondary into the bridge rectifier will produce almost 29 volts to the regulator.

A six amp bridge rectifier converts the AC from the transformer to DC, while the two 4700 μF capacitors smooth out the ripple. The input to the LM317 is bypassed with two small 0.47 μF capacitors. The output is also bypassed with a 0.47 and a 2.2 μF capacitor.

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Microwave P3D

Here's all you need to know.

Microwaving is a very interesting area of our varied hobby, and one on which I have centered my attention for a number of years. There are numerous reasons for this interest. Microwaves are still not fully understood, and many of the propagation modes are still being investigated, especially as the commercial world is not interested in the "anomalous" propagation events that we get excited about.

Microwaves are also an area where home-brewing is the norm, and, certainly for the higher microwave bands, a must, as the big three do not produce equipment for any band above 1.2 GHz. This leads microwaving to be an area for experimentation, and one in which home-

brewing your own equipment is still the norm. I was therefore very pleased to hear that Phase 3-D would carry a range of microwave transponders, a move I think will revolutionize the world of satellite amateur radio.

So what are "microwaves," and why the big interest for Phase 3-D?

Well, in amateur terms, microwaves refer to any band above 1 GHz, so any band from 1.2 GHz and up can be referred to as a "microwave" band. As for Phase 3-D, this new satellite is a revolution for the amateur world. For the first time, an amateur satellite is carrying a full range of new and exciting transponders, allowing global amateur communications using small, compact, low power ground stations.

For the old-time satellite hams reading this, a word of warning! I am going to be controversial. No, I mean "really" controversial, because I predict that once Phase 3-D flies, modes using VHF/UHF uplinks and downlinks are dead and buried. Read on and I'll explain, but mark my words, mode B is dead! Long live mode L/S! Remember where you heard it first!

Phase 3-D is a big satellite. The other articles in this issue will cover a variety of topics about P3D, so I will concentrate only on the microwave aspects of Phase 3-D and leave the other specialists to their areas.

The P3D satellite carries a range of microwave transponders almost covering the entire amateur microwave spectrum. The lowest band covered is the 23cm band (1296 MHz), and the



Photo A. P3D microwave antenna array.

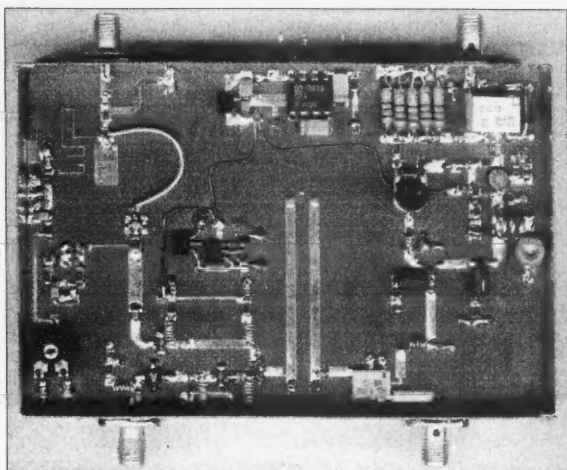


Photo B. Single board microwave transverter.

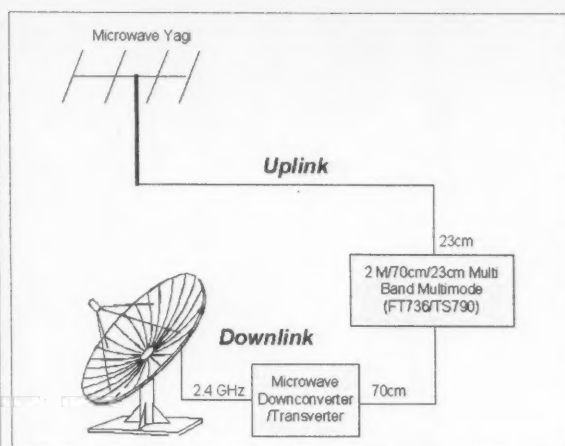


Fig. 1. Phase 3D microwave ground station using 2 x 2 meter multimodes (mode L/S).

highest, the 24 GHz band. A full list of microwave transponders is shown in Table 1 of the article "With Fingers Crossed" elsewhere in this issue.

The P3D transponders operate on a matrix, allowing any one transponder to "talk" to another. This allows an unlimited combination of transponders to be operated by the ground control stations. Each transponder also has a set of beacons that will transmit a variety of information. These beacons will primarily transmit 400 bps PSK, a mode already used on previous AMSAT missions, and one for which a vast number of ground stations are already equipped.

More importantly, these beacons will also transmit at a known power level. That is a vital piece of information, because knowing that the beacon transmits a set power level, you can make improvements to your station, or carry out measurements, and have the ability to measure these changes using the beacon as a known standard. The satellite will carry standard analog transponders that will allow SSB/CW signals to be transponded, but there are also a variety of digital experiments being flown, including digital cameras, a flying mailbox system, and high speed digital modulation experiments. The microwave bands make these experiments particularly interesting. The up/downlinks will be strong, and the bandwidth of each transponder is wide enough to carry some interesting signals and some unusual experiments.

The satellite is bristling with antennas for the microwave bands, and these will allow P3D to produce excellent signals on the ground as they have compact beamwidths and high gains.

Photo A shows the impressive array of microwave antennas onboard the satellite. It is relatively easy to calculate the power required versus antenna gain by using a small spreadsheet program. One such spreadsheet has already been produced for Microsoft Excel and is available on the AMSAT Web site. It shows that very small amounts of power will be required to very modest antennas (small dish of 60cm or small yagi).

So why are microwaves so important to the future of amateur satellites?

For a long time now, VHF/UHF have become very noisy, in some places almost unusable. Users of the FM repeaters on the UOSATs will tell you that in some parts of the world they are unworkable due to the variety of ground-based services that illegally (and sometimes legally) use the VHF and UHF satellite subbands.

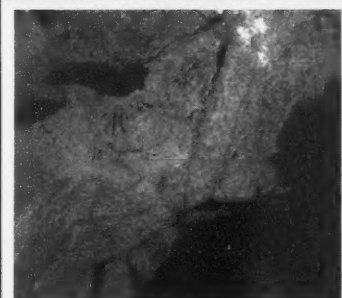
In 1992, James Miller G3RUH said that mode S would become the preferred downlink for Phase 3 satellites, and I would support that theory wholeheartedly. Here are some reasons why, and before you diehard mode B operators jump off the deep end, think about the points carefully and consider their technical merits:

- 145 MHz is noisy. This comes

from a variety of sources: electrical, the weather, the sun, sky, other users, computers, SATTV, and the list is almost endless. And it's getting worse! Is this the right band for downlinks?

- Antenna sizes for 2 meters are big — with planning development problems becoming common and gardens

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Photo C. Freddy ON6UG, working 2.4 GHz.

becoming smaller (in Europe anyway!), antenna size has become a major factor in people's operations. Which would be easier to install, a 10- or 11-el yagi for 2 meters or a 60cm SATTV dish?

- Technically, VHF is a poor choice. The typical noise at VHF measures approximately 1200k. At 1.2 GHz, this is typically 120k, a factor of 10 times quieter. This means that for a given radiated power the ground station antenna could be 10 times smaller. Given that a 60cm dish could have 25 dB

gain at 2.4 GHz, and a typical 10 element yagi approximately 10 dB gain, that size decreases even further.

- Give smaller antenna sizes that also relate to cost and station equipment. No more large antenna arrays, less mechanical engineering, less windage, less maintenance, less neighborhood impact. It goes on and on!

Recent demonstrations at the AMSAT-UK Colloquium on UO-36 showed how suitable 2.4 GHz is for satellite downlinks. A quote from Peter Gültzow DB2OS summed this up suitably: "Freddy's (ON6UG) S-band downlink demo was a real eye-opener for all. It gave a pretty good idea of what we can expect to see on P3D, and Freddy said that the dish antenna he demonstrated (60cm parabolic) was already overkill. Many people understood why P3D will be the Easy-Sat."

And that demonstration was with a whopping 1 watt down from UO-36 with the antenna off-pointing by several degrees! Since 1992 technology at microwave frequencies has marched on, and access to microwave frequencies is easier now than it ever has been. So what technical reason is there for not using them for satellite down/uplinks?

Antennas

What kind of equipment will be needed for P3D microwaving? Well, let's look at antennas first. Starting on

the lowest band at 23cm, a small helical yagi will be required. These are available cheaply commercially, or even cheaper if home-brewed.

The *ARRL Handbook* contains the design details for a suitable antenna. For the higher bands, small parabolic dishes will be the norm, although for 2.3 and 3.4 GHz small helical yagis are still perfectly feasible. The dishes do not need to be anything special. Down East Microwave sells a range of 500mm and 600mm dishes that will be perfect for the job. Dish feeds are easy to make and will either be small horn feeds using food tins, or helical feeds using a few turns of copper wire mounted on an N-type connector at the focal point of the dish.

The beauty of such small dishes is that the beamwidth of the dish will still be quite wide (510 degrees), and it will be much easier to point at P3D. "More expense," I hear you groan! Not really! There is a plethora of ex-SATTV parts available at flea markets. An SATTV positioner screw jack will be perfect to use as an elevator, and even better if you still have the original control unit!

Feeding the dishes and yagis is worthy of note. Microwave power is expensive to generate, and you don't want to lose that power in poor cables and connectors. Use only the correctly rated connectors (N types and SMAs at anywhere above 1 GHz), and interconnecting cables and feeders should be the best possible rigid foam coax you can get your hands on.

Here is another advantage of using microwaves. The dishes and positioners do not need to be mounted high, as long as they have a clear view of the sky. Mounted on the apex of a roof or on a small tripod on a garage or conservatory flat roof will be fine. The closer to the shack the better, keeping feeder lengths as short as possible. In my station, the tripod is mounted on the lawn outside the shack window — a distance of only 12 feet!

RF equipment for P3D is readily obtainable, and many people have a 2 meter multimode in the shack already. This is an excellent starting point, as most microwave transverter designs use 2m as the driving band. High

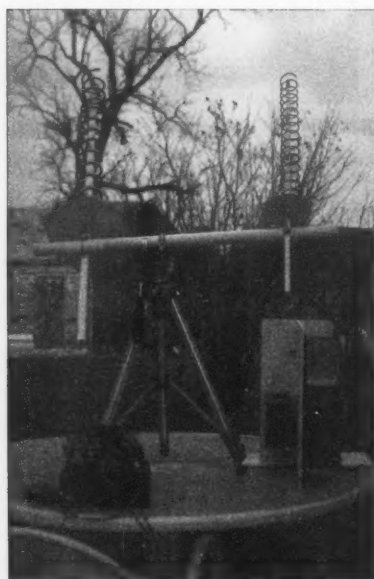


Photo D. Complete mode L/S station.

power is not necessary for the transverter; most require just a couple of watts in. 23cm modules are available for older radios such as the Kenwood TS-790 and Yaesu FT-736R. More modern radios such as the Icom IC-821 and Yaesu FT-847 are also suitable, having the built-in satellite functions required for P3D. Of course, two separate 2 meter multimodes driving individual transverters is perfectly acceptable, and there are a number of ready-built 23cm designs available from commercial sources. SSB Electronics, Down East Microwave, and DB6NT all produce suitable equipment.

It's easier than you think

Life gets a little more complicated on the higher bands, and we have to overcome what is known as "Microphobia" — an irrational fear of constructing anything for the microwave bands! Outlining how amateur microwave equipment is constructed could

be the subject of a completely separate article! But it really is quite simple, and the rule of thumb is that if you can follow a set of basic construction rules, place components exactly onto a PCB as the designer originally intended and as shown in the documentation, and learn to solder surface mount components using a small soldering iron, then you really can construct microwave equipment.

I managed to construct a working 10 GHz transverter that worked first time, having never constructed a piece of microwave equipment before. I can do it, many others have done the same, and you can do it, too — honest! It's quite simple, and not rocket science (excuse the pun!), and within every amateur's capability. Modern microwave units are quite simple and usually contain very low component counts. A typical single board 23cm unit designed by Charlie Suckling G3WDG, and available as a kit from

the Microwave Components Service of the Radio Society of Great Britain, is shown in **Photo B**.

A variety of kits and modules for the higher bands are available from a multitude of sources, and many of these kits are easily constructed by following the basic microwave construction rules. Many of these kits have been in the planning stages for some time, awaiting the day that Phase 3-D flies.

So how does a station fit together? **Fig. 1** shows the basic block diagrams of simple stations for use on Phase 3-D. Most of the stations simply require either a multiband, multimode, such as an FT-847/FT-736/TS-790 and transverters, or rely on two dedicated 2 meter multimodes and dedicated transverters for uplinks/downlinks. The transponder matrix in Table 1 of "With Fingers Crossed" indicates that any uplink could be connected to any downlink, so it is easy to come up with a few basic building blocks that can be



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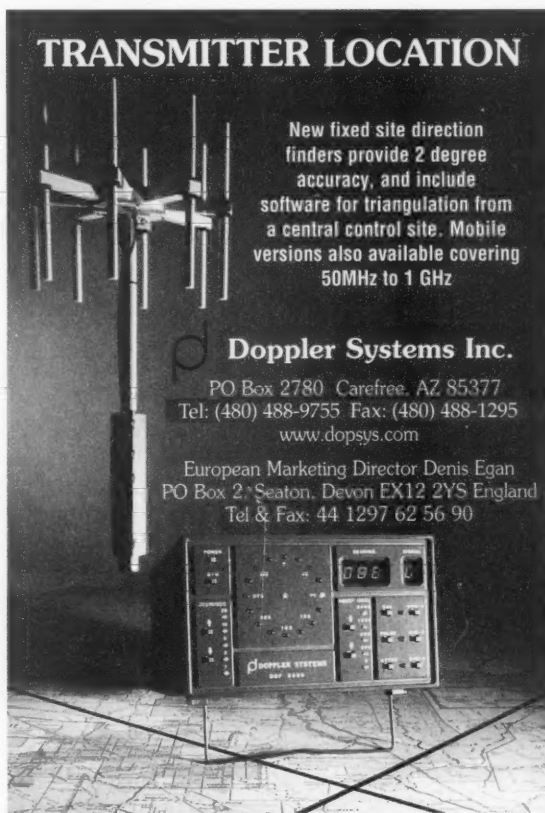
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mixed and matched to provide capability for a variety of transponder modes.

Operating P3D will be a joy using microwaves. Signals will be very loud and crystal clear, with little noise received from other sources. The microwave bands are relatively quiet at these high frequencies, and P3D downlinks will not suffer from the terrestrial interference that mode B or J suffers from ground-based sources. As antennas beamwidths are relatively narrow compared to VHF/UHF yagis, stations using just a few watts will be the norm. A multitransponder ground station will be neat, compact and very efficient. For those of you living with small suburban gardens, this is your passport to paradise. The ability to work stations worldwide with just a small dish antenna and miniature yagis on the lawn or garage roof will be very pleasing, and will open the door to many amateurs who may previously have been limited in their operations.

I predict that there will be a surge of satellite activity as many amateurs take advantage of these features and the ability to operate long-range communications from such compact antenna systems. Have I convinced you yet that mode B/J is dead?

The microwave bands will also be beneficial when using the high speed data projects such as RUDAK (flying digital mailbox) and SCOPE (digital camera project). With noise-free downlinks and wide bandwidths able to support reliable high speed datacoms, these downlinks will become essential to reliable high speed digital communications and will support these projects perfectly. It is almost certain that the microwave downlinks will be essential to make the most of these projects.

So how do I get started, I hear you ask? Well, you started already by reading this article.

The next stage is to assess what equipment you already have available to spare, and to decide whether this equipment is to be permanently allocated to satellite communications. Once you have decided what bands to use and what equipment you already have to spare, you can then make a judgment on what equipment you will need to buy and construct.

One word of advice, however! Don't be afraid to look at commercial satellite TV equipment for use within your station. Satellite positioners and surplus dishes are all suitable, in fact highly desirable, if you can obtain them, and they will save hundreds of dollars over new, dedicated amateur items that will do the same job. Horn feeds and yagis are easily constructed using simple hand tools, if you do not wish to buy new. Where you should spend money is in feeder or RF equipment. Money spent here will be well-founded and provide an excellent basis on which to work.

Phase 3-D's microwave transponders will offer an excellent way of becoming involved in amateur microwaves, and the UK is already seeing an upsurge in activity as people gear up for Phase 3-D. This new satellite offers amateurs the perfect opportunity to become involved in one of the most interesting aspects of amateur radio, one that will surely change the face of amateur satellite operations from the moment of launch. Hopefully, sometime later this year you should get the opportunity to become part of that history. Be brave, and listen to the technical reasons for using microwaves. The future is here, and it is a bright one in the microwave spectrum.

Godspeed, Phase 3-D, and here's wishing the P3D crew all the best for a successful launch campaign. See you in history, 73 de Simon GM4PLM. 73

With Fingers Crossed

continued from page 16

Note

1. *Radio Communication Handbook*, 7th edition, published by the RSGB, UK. 73

Cruising for Satellites

continued from page 26

(AO-37?) using a "big" rig, the Yaesu FT-847 [<http://www.yaesu.com/ft847.html>]. The antenna will be an Arrow II on a tripod. The MV CPR is appropri-

ately named, as it has been reflated after sinking twice in 1997.

Are you ready?

WB5RMA [<http://www.heathermacalister.com>] and I are already thinking about taking a cruise in Alaska waters next year. We've seen great video tape from AMSAT Awards Manager Mike Scarcella WASTWT and his XYL Rae, from their Alaska cruise. We've heard the story of Lee KØLEE's "inside passage" grid expedition. Why not?

There are a lot of radios and antennas out there that I would like to try, but only, of course, during those free times out on the water when the floating casinos and bars seem dim compared to the bright or starlit skies from the upper decks. Check out [<http://www.amsat.org>] for more information about the hamsats and how to use them. 73

OSCAR-10 Antenna System

continued from page 37

Simple answer — use the best you can afford. This is more of an issue if your feedline run is long. The shorter your feedline, the better. I am using 9913 between the station and the preamps, and Bury-Flex from The Wireman between the preamps and the antennas. Make sure the feedline you are using is capable of the twisting and flexing that is required to go around the rotators. Also pay particular attention to make sure that the feedlines will not bind or get caught on anything, while both rotators are moved throughout their entire range of movement. Whenever any change in the feedline routing around the rotators is made, make sure that the cables won't bind on anything. I always stand on the roof and watch while someone in the shack moves the rotators throughout their ranges of rotation. Because my antennas are very close to the roof of my house, I can't have the feedlines hang off the back end of the antennas (as is often recommended), to prevent having the feedline disrupting the antenna pattern.

Continued on page 59

OSCAR-10 Antenna System

continued from page 58

The future

Later this year, I plan to install a heavy-duty 40-foot tower. When the tower gets installed, the satellite antennas will be moved to the tower, and the preamps may be moved to the antenna feedpoints. Although I don't need the higher elevation by moving the antennas to the tower, I am doing it because I use the satellite antennas for some terrestrial SSB operating, and, maybe more importantly, in order to get my wife to agree to the tower, I will be replacing the existing mast with the tower, not "adding" the tower. Got to keep my nonham wife happy! 75

CALENDAR EVENTS

continued from page 42

on-site, beginning at 8 a.m., by CAVEC. Bring original and a copy of your current license, picture ID, and \$3 fee.

NOV 12

CHICAGO, IL The DeVry Institute of Technology, 3300 N. Campbell Ave., Chicago IL, is the location for the Chicago ARC Ham Auction, Sunday Nov. 12th. Items in auction will be transmitters, receivers, transceivers, amplifiers, tuners, accessories, signal generators, oscilloscopes, 2-way radios, TVs, VCRs, antique radios, tubes, parts, books, computers, audio, stereo, etc. Your electronic goods will be auctioned if you bring them in before noon. All sold goods are subject to a 10% donation. If purchased back by the seller, then a 5% donation will be due. All items sold on an as-is as-shown basis. All sales final. For more info, call Dean, (708) 331-7764, morning or evening; call George, (773) 545-3622, 10 a.m.-1:30 p.m. or after 3 p.m. Remember, one man's junk is another man's gold!

NOV 18, 19

FT. WAYNE, IN The 28th Annual Fort Wayne Hamfest & Computer Expo, sponsored by the Allen County Amateur Radio Technical Society (AC-ARTS), will be held at the Allen County War Memorial Coliseum at the corner of Indiana 930 (Coliseum Blvd.) and Parnell Ave. Open to the public 9 a.m.-4 p.m. EST on Saturday, and 9 a.m.-3 p.m. EST on Sunday. Vendor setup is Friday evening and Saturday morning. Admission \$5, good for both days, at the door only. Parking is \$2. There are over 1100 commercial and flea market tables all

under one roof, containing both new and used radio, computer, and general electronics items. Activities will include many forums and meetings, with VE exams on Saturday. Shuttle bus service provided to and from Smith Field Airport, and shopping centers. Talk-in on 146.88(-). For more info, leave a message on the answering machine at (219) 483-8163 (tables), or (219) 484-1314 (general info), and you will be contacted. You can also send an SASE to AC-ARTS / Fort Wayne Hamfest, P.O. Box 10342, Fort Wayne IN 46851; or visit the WWW site at [http://www.acarts.com].

SPECIAL EVENTS, ETC.

OCT 9-15

ATLANTIC CITY, NJ The Southern Counties ARA will operate K2BR from Oct. 9th at 1400 UTC to Oct. 15th at 0400 UTC, from the Miss America Pageant in Atlantic City NJ. Atlantic City is located on Absecon Island, which is IOTA NA111. Suggested frequencies for 10, 15, 20 and 40 meters: Phone — 28.325, 21.325, 14.250, and 7.250. CW — 28.030, 21.050, 14.050 and 7.050. QSL with a #10 SASE to SCARA, P.O. Box 121, Linwood NJ 08221 USA.

OCT 28, 29

MOROCCO The Bavarian Contest Club will be operating again as CN8WW from Morocco, in the CQ WW Contests. They will be a Multi/Multi team, so there is a very good chance to work CN on all bands from 160-10m. There will be a new picture QSL card for the upcoming activities. Work CN8WW on 5 or 6 bands and receive a special QSL card to honor your high performance. CQ WW Contest SSB: QRG's (± QRM): 1.840 / 3.799 / 7.099 / 14.255 / 21.355 / 28.455 kHz. Before and after the contest the station will operate as 5C8M in CW, SSB, RTTY, on 6 meters, and also on the WARC bands. Check the homepage [http://www.dl6fbl.de/cn8ww/] for information about the DXpedition. QSL cards for CN8WW and 5C8M go via DL6FBL (buro or direct): Bernd Och, christian-Wirth-Str. 18, D-36043 Fulda, Germany.

OCT 31

BREVARD, NC For the 12th consecutive year, the Transylvania County ARC will operate a Special Event station from Transylvania County NC on Halloween. The callsign will be K4HXZ. Hours of operation will be from 1800Z-2359Z on Oct. 31st. Frequencies will be 7.195, 14.295, 21.365, and 28.335 SSB; also 146.55 FM simplex. For certificates, send a business size or 9 x 12 SASE to T.C.A.R.C., P.O. Box 643, Brevard NC 28712 USA. Weather permitting, operation will be from The Devil's Courthouse, on the Blue Ridge Parkway. 73

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Stability — or Blackout?

Worldwide conditions should improve steadily as the HF-friendly winter months approach, but with sunspot Cycle 23 nearing its peak, strong solar disturbances may occur more often ... witness the severe particle storm of July 14-16! The most likely ionospheric disruptions will occur near the middle and at the end of the month — the latter possibly causing a partial blackout lasting into the early days of November.

Generally, moderate daytime ionospheric absorption at midpath local noon is expected, especially for paths across the Equator. Echo and fading associated with the aurora will often be present across the higher latitudes, but VHF CW operators might take advantage of short, late-night auroral-E openings of up to 1,200 miles.

On most days, however, the ionosphere should be quite stable, easily recovering from the smaller disturbances and providing excellent around-the-clock HF opportunities. Be sure to work the twilight "gray line" for some very long paths into South America, and also look for some unusual opportunities just before and after the (P)oor days marked on the calendar.

Band-by-Band Summary

10/12 meters

Good daytime paths will occur between the coasts and into Central and South America, but expect some noontime fading. Look for afternoon openings into the Pacific and Australasia, with an occasional path to Africa. A short-skip of 1,000-2,000 miles will be typical.

15/17 meters

Openings to most areas of the world should occur on (G)ood days, especially south of the Equator. Try Europe before noon, Africa and the Middle East after noon, and the Pacific or Asia in the late evening. Short-skip distances average about 1,000 miles.

October 2000						
SUN	MON	TUE	WED	THU	FRI	SAT
1 F-G	2 F-G	3 F-G	4 G	5 G	6 G	7 G
8 G	9 F-G	10 F	11 F-P	12 F	13 F	14 F
15 F	16 F-P	17 F-P	18 F-P	19 F	20 F-G	21 G
22 G	23 G	24 G	25 F-G	26 F-G	27 F-G	28 F-P
29 P	30 P	31 VP				

Table 1. Calendar.

EASTERN UNITED STATES TO:

TO:	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Central America	15-20	15-50	20-40	20-40	(20-40)	(20)	10-20	10 (20)	10 (20)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20
South America	15-20	(15) 20	20 (40)	(20-40)	(20)	x	(15)	10 (15)	(10)	(10-15)	10-15	15-20	15-20	15-20	15-20	15-20	15-20	15-20
Western Europe	(20) 40	30-40	(40)	(40)	x	x	(15)	15	(10) 17	15-20	(15) 20	20	20	20	20	20	20	20
Southern Europe	20 40	(20)	20-40	(20-40)	x	x	(15)	(10) 15	10 (15)	(10) 15	15-20	(17) 20	20	20	20	20	20	20
Africa	(20-40)	(20-40)	17-20	17-20	(20)	(20)	(15-20)	(10) 15	(15)	17 (20)	17-20	(17-20)	20	20	20	20	20	20
Eastern Europe	(20)	20 (40)	20	(20)	x	(20)	x	(10-15)	(12) 17	(15-20)	(20)	(20)	20	20	20	20	20	20
Middle East	(17-20)	x	x	x	x	x	x	(15-17)	x	x	x	x	x	x	x	x	x	x
India/Pakistan	10 (15)	(20)	17-20	(20)	x	x	x	x	x	x	(15-17)	(10) 15	15	15	15	15	15	15
Far East/Japan	x	x	(17-20)	x	x	(17-20)	(17-20)	(10-15)	x	x	x	(15)	15	15	15	15	15	15
Southeast Asia	(10-15)	(17-20)	20	20	(20)	(30-40)	(20-40)	17-20	x	x	x	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)
Australia	10-17	x	20	x	x	x	17-20	20	x	x	15-17	10-12	10-12	10-12	10-12	10-12	10-12	10-12
Alaska	10-12	12-15	17-20	20-30	20-30	20-30	17-20	17-20	x	x	x	10-12	10-12	10-12	10-12	10-12	10-12	10-12
Hawaii	15-20	20-40	20-40	(20) 40	30-40	x	x	(10) 20	10-20	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)
Western USA	15-20	20-40	20-40	(20) 40	30-40	x	x	(10) 20	10-20	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)

CENTRAL UNITED STATES TO:

TO:	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Central America	(15-20)	20 (40)	20-40	20-40	(20-40)	x	(10-20)	10-20	10-20	10 (20)	10 (20)	10-20	10-20	10-20	10-20	10-20	10-20	10-20
South America	15-20	17-30	17-30	20 (40)	(20)	(20)	x	(10-15)	(10)	(10)	10-15	10-17	10-17	10-17	10-17	10-17	10-17	10-17
Western Europe	(20)	(40)	(40)	x	x	x	(20)	(15-20)	15	12-17	(15) 20	20	20	20	20	20	20	20
Southern Europe	(20)	(20-40)	20	(20)	x	x	x	x	(10)	10-15	15 (20)	(15) 20	20	20	20	20	20	20
Eastern Europe	(20)	x	(20-40)	x	x	x	x	(20)	(15)	(20)	20	20	20	20	20	20	20	20
Middle East	(20)	(40)	x	x	x	x	x	(15)	15	x	(20)	20	20	20	20	20	20	20
India/Pakistan	x	(15-20)	x	x	x	x	x	(15-20)	x	x	x	x	x	x	x	x	x	x
Far East/Japan	(10-15)	(15-20)	(20)	(20)	x	x	(20)	(20)	x	x	x	(10-15)	15	15	15	15	15	15
Southeast Asia	(10-15)	x	(20)	x	x	x	x	x	(10-15)	(15)	x	x	x	x	x	x	x	x
Australia	10 (15)	12-17	(15-20)	(20)	20	20-40	20-40	(20)	x	x	(15)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)
Alaska	15-20	(20-40)	(40)	(40)	x	10-20	10-20	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30
Hawaii	10-15	12-17	12-20	(15) 20	17-30	20-40	30 (40)	17-20	x	(10) 13	10-15	(10) 15	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)

WESTERN UNITED STATES TO:

TO:	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
Central America	10-20	15-20	15-30	(14) 40	(20-40)	x	(15-20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)
South America	10-20	15-20	(15-20)	(15) 20	(17-30)	(17-30)	x	x	x	x	(10-12)	(10-12)	10-12	10-12	10-12	10-12	10-12	10-12
Western Europe	(17-20)	(17-20)	x	x	x	x	x	x	(15-17)	(15-17)	15 (20)	17-20	17-20	17-20	17-20	17-20	17-20	17-20
Southern Europe	17-20	(20)	x	20	x	x	x	x	x	10-12	(12) 17	15-17	15-17	15-17	15-17	15-17	15-17	15-17
Eastern Europe	(17-20)	x	x	(17-20)	x	x	x	(20)	x	(15-20)	(20)	(20)	20	20	20	20	20	20
Middle East	x	(20)	(20)	x	x	x	x	x	(15)	(15-17)	(17-20)	(20)	20	20	20	20	20	20
India/Pakistan	x	(15-17)	(17-20)	x	x	x	x	x	(15-17)	x	x	x	x	x	x	x	x	x
Far East/Japan	(10) 17	10-17	(15)	(17-20)	17-20	17-20	(20-30)	(20)	(17-20)	x	x	(15-17)	15	15	15	15	15	15
Southeast Asia	(10-20)	10 (15)	x	x	x	(20)	(20)	(17-20)	(15) 20	(15) 20	x	x	x	x	x	x	x	x
Australia	10-12	10-15	(10) 17	(15) 20	17-20	17-20	(20) 40	(20-40)	(15-20)	(20)	(15-17)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)	10 (15)
Alaska	10-20	10 (40)	(10) 40	20-40	(20-40)	(20-40)	(40)	(20-40)	x	(15)	(15)	15-20	15-20	15-20	15-20	15-20	15-20	15-20
Hawaii	10-20	(10) 20	15-40	20-40	(20) 40	40	(40)	x	(20)	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20	10-20
Eastern USA	15-20	20-40	20-40	(20) 40	30-40	x	x	(10) 20	10-20	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)	10 (20)

Table 2. Worldwide HF band openings for October 2000. Notes: (1) Plain numerals indicate bands which should be workable on Fair to Good (F-G) and Good (G) days. (2) Numbers in parentheses indicate bands usually workable on Good (G) days only. (3) Dual numbers indicate that the intervening bands should also be usable. When one number appears in parentheses, that end of the range will probably be open on Good (G) days only. (4) Be sure to check adjacent bands and times (± 2 hours) for additional openings.

20 meters

As usual, most areas of the world are workable from just after sunrise until long after dark. Peaks are often right after sunrise, again in the late afternoon, and in the hour or so before midnight. Expect a 500–1,000 mile short-skip during the day and 1,500–2,000 miles at night.

34/40 meters

Don't overlook these bands for daytime short-skip up to 1,000 miles, but you'll do best at night into Central or South America and Australia, especially on (G)ood days. Operators east of the Mississippi might try working the Mediterranean after dark. Daytime short-skip is typically about 1,000 miles and 500–2,000 miles after dark.

80/160 meters

Worldwide DX can be observed from local sunset until local sunrise on (G)ood days, provided that atmospheric noise is low to moderate. Good activity on 40 meters is a clue that these bands might be open. Short-skip is usually from 1,000–2,000 miles.

73 and happy DXing!

ON THE GO

continued from page 43

So, as you're planning, after you have identified the agencies you will serve and where those agencies will need hams, take a good hard look at the physical constraints and determine how you can best equip these facilities to ensure optimal operation.

Do you have a map of the area showing the coverage of your key repeaters? Have you thought of equipping the locations at the fringe with higher-power radios? Maybe it's a good idea to save the HT-equipped operators for those locations closer in. If there is a shelter you will be manning, do you know where the communicator will be located? Has anyone tried this operating location before things get a little intense? If there is emergency power available, is the operating position located so that the emergency power can be accessed? Hospitals, for example, have redundant emergency power available, but not every electrical outlet will provide emergency power.

External antennas are the other area that must be investigated. If you have a good relationship with your supported agencies, getting external antennas mounted may not

be a totally insurmountable problem. There may be a few hurdles. Shelters are often located in local schools, and the school board may not be interested in people poking holes in their roofs. On the other hand, if the local Red Cross is requesting it, there may be a more positive response. If the county Emergency Management Office is interested in repositioning antennas, the response might be downright enthusiastic. Something about the county and its ability to impact funding or something.

Don't forget the 6 Ps! Planning may not make a difficult situation easy, but it can make it doable. Learn from the mistakes you've faced in the past, and help others learn from yours. Share your ideas for keeping Murphy out of the equation when responding to a disaster. What problems have you encountered? How did you solve them? What lessons have you learned that you'd like to pass along? I'll be glad to hear from you. If you submit an interesting enough idea, I'll even see that it gets passed along so that other readers can benefit from your experience.

HOMING IN

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banquet and local airport transit in this price, but you might decide to offer these separately. Some participants may choose to stay with relatives or in another location, so an alternative price without lodging and meals (but including the box lunches on competition days) should be announced.

So that's what it takes to put on a multination ARDF event. It's not too hard. If your club members have ever put on a big hamfest or ARRL Convention, then they probably have all the needed experience and skills.

What better way to generate enthusiasm in your club, help your fellow hams, promote international goodwill, and have a great time doing it! As USA's IARU ARDF Coordinator, I'll try to help every step of the way. Contact me, and let's get started!

NEVER SAY DIE

continued from page 8

staffers were released to go out and find productive work.

Cold fusion development has been stymied by the oil-coal-gas-power company bloc making sure the research funding has been cut off. For under \$10 million in cold fusion development we might be able to leave some oil in the

ground for our grandchildren and great-grandchildren, instead of stripping the planet of every drop of recoverable oil.

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NEVER SAY DIE

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Forever. And never mind how this would clean up the air in our cities. Cough.

Bore is in hot water over lying about his fund-raising activities. Jeeze, someone in the White House lying? Tell me it isn't so, Joe. Well, you can read the gory details in the newsmagazine reports (see *Time*, July 3rd, p. 32), which nails Bore.

Mind you, I'm no fan of Gush, and I dislike many of the goals of the Republicans. Nor am I a fan of the tax and spend Democrats, and their constant love affair with socialism. I like many of the Libertarian ideas. The Reform Party has possibilities, if it can shake its connections with Perot and disentangle itself from the Buchanan bunch's efforts to steam-roller it.

Anyway, it's Bore and Gush. Bore fans should make every attempt to avoid reading the Nicholas Lemann 18-page piece in the July 31st issue of *The New Yorker*, a magazine not particularly known for its leanings to the right. Nick, who has traveled extensively with the vice president, endlessly skewers him with his own quotes, showing him to be a chameleon politician, with no detectable thoughts of his own. His "opinions" have been and are carefully crafted by focus groups to match the sentiment of the day. His speeches, prepared by his staff, are almost word-perfect duplicates of each other.

However, if you want to know more about this potential president, then please take the time to read the article. If you're not a subscriber, despite my past recommendations, then at least visit a library.

If an 18-page article is beyond your reading ability, then you can get the core concepts by reading the three-page article in the August issue of America's 1st Freedom, the NRA magazine. Bore used to be a poster boy for the NRA, receiving three "A" grades from the NRA Political Victory Fund — now he's championing gun licensing,

registration, and taxing. This piece nails Bore on his lies and exaggerations — on his war record, his having "found" Love Canal, creating the Internet, on his abortion stand, campaign finance reform, and so on. He's now anti-tobacco, yet he continued to farm tobacco and pep talk his fellow tobacco producers for four years after his sister's death from lung cancer.

Sowell Food

Though politically I'm a conservative, about the only columns I really enjoy in *Conservative Chronicle* are those by Thomas Sowell. He's worth the price of the subscription for me.

Frinistance, "With all the political hysteria whipped up this year about school shootings, more children are killed each year by bee stings — and far more killed by airbags mandated by the government."

And, "When my daughter recently asked me what the Department of Energy does, it was hard to answer. What she really meant was: What does it accomplish? The answer is practically nothing, except creating a nuisance with regulations and red tape."

Well, you get the idea.

Genome Piffle

Wow, bi-i-g deal, they've done a rough outline of human genes, a project, according to the press, on the level of our putting a man on the Moon. Well, you know what I think of that hoax, so ask me what I think of the value of the genome project.

Glad you asked. Piffle.

Yes, certain illnesses do tend to run in certain families, and I don't doubt that genetic differences will exacerbate the problems for people. And, yes, scientists may be able to repair these "defective" genes.

For that matter, parents screw up their children's genes by ingesting poisons such as alcohol, nicotine, caffeine, NutraSweet, and so on prior to conception, damaging the genes in their sperm and ova.

Plus further damage during pregnancy, and so it goes. We know that, just by doing the right things at the right time, it's possible to increase a child's IQ by 40 to 50 points over not knowing what to do when.

But curing most of our illnesses with gene therapy? Nonsense.

I'm convinced that miseries such as Alzheimer's, Parkinson's, cancer, heart trouble, and so on can be eliminated by treating our bodies better. I go into detail in my *Secret Guide to Health*. My mantra is simple: Stop poisoning your body, give it the food it has been designed over a thousand generations to use, plenty of pure water, lots of sun and exercise, and keep stress to a minimum.

We eat pop tarts, coffee, and Danish for breakfast, Whoppers with fries for lunch, and pizza for dinner, and then blame genes for the mess we've made of our body. Phooey.

More Anthrax

While watching a segment on *60 Minutes* about a soldier being court-martialed and discharged for refusing to be inoculated with the anthrax vaccine, one thought never seems to have occurred to anyone involved. Of course the excuse given for making every member of the military get the anthrax vaccine was to protect them during the Gulf War.

But that was ten years ago! That excuse doesn't make sense anymore.

If the Long and Jones bioterrorism book is right, Iraq has over a hundred eleven-person cells in the U.S., all busy making and freeze-drying anthrax pathogens. Their plan is to suddenly spread this in our major cities, and use crop dusters over smaller towns, with the goal of killing 200 million Americans within a few days.

Now, if this is true, the government most certainly knows about it. But, since there's no way to inoculate 350 million Americans, they don't want to create a panic by letting the

word out — particularly since there's not much they can do to prevent it from happening — and worse, going public might trigger the attack.

To me, the spreading of an oral anthrax vaccine from the air, as a way to make it so we'd just get sick, but not die, makes sense. Further, since they have enough vaccine to inoculate the military, I can understand why they've made it mandatory. If 200 million Americans die, we'll have martial law in place immediately.

I listened to a lame excuse for the chem trails the other night. They're just high-flying con trails. Oh, baloney. I've seen the skies over southern New Hampshire criss-crossed with chem trails, spreading out and slowly falling to earth. At the same time I've seen some con trails at a higher level, and they were going the normal route from Europe to Boston and Chicago, which passes over my area, and fading away after a few minutes. And Art Bell interviewed a military pilot who said that his tanker plane had often been fully loaded by the CIA with some liquid when he took off. He then had to fly a weird flight plan, and when he landed his tanks were empty. Water crystals from con trails? Sure.

With there turning out to be so many things that our government has lied to us about, I don't have to be a conspiracy theory nut to be suspicious of it — particularly when the pieces of a puzzle seem to fit.

Trusting the FDA

It's approved by the FDA, so where's the problem? Here's a government outfit that charges food and drug companies an average of around \$250 million to okay a product for sale to the public — a charge that we protected users have to pay with a higher product price. So, how well protected are we?

Well, I've written several times about the dangers of using aspartame, best known by dieters as NutraSweet. The

Continued on page 64

Wise Up!

Here are some of my books which can change your life (if you'll let 'em). If the idea of being healthy, wealthy and wise interests you, start reading. Yes, you can be all that, but only when you know the secrets which I've spent a lifetime uncovering.

.....Wayne

The Bioelectrifier Handbook: This explains how to build or buy (\$155) a little electrical gadget that can help clean the blood of any virus, microbe, parasite, fungus or yeast. The process was discovered by scientists at the Albert Einstein College of Medicine, quickly patented, and hushed up. It's curing AIDS, hepatitis C, and a bunch of other serious illnesses. The circuit can be built for under \$20 from the instructions in the book. \$10 (#01)

The Secret Guide to Wisdom: This is a review of around a hundred books that will help you change your life. No, I don't sell these books. They're on a wide range of subjects and will help to make you a very interesting person. Wait'll you see some of the gems you've missed reading. \$5 (#02)

The Secret Guide to Wealth: Just as with health, you'll find that you have been brainwashed by "the system" into a pattern of life that will keep you from ever making much money and having the freedom to travel and do what you want. I explain how anyone can get a dream job with no college, no résumé, and even without any experience. I explain how you can get someone to happily pay you to learn what you need to know to start your own business. \$5 (#03)

The Secret Guide to Health: Yes, there really is a secret to regaining your health and adding 30 to 60 years of healthy living to your life. The answer is simple, but it means making some difficult lifestyle changes. Will you be skiing the slopes of Aspen with me when you're 90 or doddering around a nursing home? Or pushing up daisies? No, I'm not selling any health products. \$5 (#04)

My WWII Submarine Adventures: Yes, I spent from 1943-1945 on a submarine, right in the middle of the war with Japan. We almost got sunk several times, and twice I was in the right place at the right time to save the boat. What's it really like to be depth charged? And what's the daily life aboard a submarine like? How about the Amelia Earhart inside story? If you're near Mobile, please visit the Drum. \$5 (#10)

Wayne's Caribbean Adventures: My super budget travel stories — where I

visit the hams and scuba dive most of the islands of the Caribbean. You'll love the special Liat fare which let me visit 11 countries in 21 days, diving all but one of the islands, Guadeloupe, where the hams kept me too busy with parties. \$5 (#12)

Cold Fusion Overview: This is both a brief history of cold fusion, which I predict will be one of the largest industries in the world in the 21st century, plus a simple explanation of how and why it works. This new field is going to generate a whole new bunch of billionaires, just as the personal computer industry did. \$5 (#20)

Cold Fusion Journal: They laughed when I predicted the PC industry growth in 1975. PCs are now the third largest industry in the world. The cold fusion ground floor is still wide open, but then that might mean giving up watching ball games. Sample: \$10 (#22). **Julian Schwinger:** A Nobel laureate's talk about cold fusion—confirming its validity. \$2 (#24)

Improving State Government: Here are 24 ways that state governments can cut expenses enormously, while providing far better service. I explain how any government bureau or department can be gotten to cut its expenses by at least 50% in three years and do it cooperatively and enthusiastically. I explain how, by applying a new technology, the state can make it possible to provide all needed services without having to levy any taxes at all! Read the book, run for your legislature, and let's get busy making this country work like its founders wanted it to. Don't leave this for "someone else" to do. \$5 (#30)

Mankind's Extinction Predictions: If any one of the experts who have written books predicting a soon-to-come catastrophe which will virtually wipe most of us out are right, we're in trouble. In this book I explain about the various disaster scenarios, like Nostradamus, who says the poles will soon shift (as they have several times in the past), wiping out 97% of mankind. Okay, so he's made a long string of past lucky guesses. The worst part of these predictions is the accuracy record of some of the experts. Will it be a pole shift, a new ice age, a massive solar flare, a comet or asteroid, a bioterrorist attack? I'm getting ready, how about you? \$5 (#31)

Moondoggle: After reading René's book, *NASA Mooned America*, I read everything I could find on our Moon landings. I watched the videos, looked carefully at the photos, read the astronaut's biographies, and talked with some of my readers who worked for NASA. This book cites 25 good reasons I believe the whole Apollo program had to have been faked. \$5 (#32)

Classical Music Guide: A list of 100 CDs which will provide you with an outstanding collection of the finest classical music ever written. This is

what you need to help you reduce stress. Classical music also raises youngster's IQs, helps plants grow faster, and will make you healthier. Just wait'll you hear some of Gotschalk's fabulous music! \$5 (#33)

The Radar Coverup: Is police radar dangerous? Ross Adey K6UI, a world authority, confirms the dangers of radio and magnetic fields. \$3 (#34)

Three Gatto Talks: A prize-winning teacher explains what's wrong with American schools and why our kids are not being educated. Why are Swedish youngsters, who start school at 7 years of age, leaving our kids in the dust? Our kids are intentionally being dumbed down by our school system — the least effective and most expensive in the world. \$5 (#35)

Aspartame: a.k.a. NutraSweet, the stuff in diet drinks, etc., can cause all kinds of serious health problems. Multiple sclerosis, for one. Read all about it, two pamphlets for a buck. (#38)

One Hour CW: Using this sneaky booklet even you can learn the Morse Code in one hour and pass that dumb 5wpm HF entry test. \$5 (#40)

Code Tape (T5): This tape will teach you the letters, numbers and punctuation you need to know if you are going on to learn the code at 13 or 20 wpm. \$5 (#41)

Code Tape (T13): Once you know the code for the letters (#41) you can go immediately to copying 13 wpm (using my system). This should only take a couple of days. \$5 (#42)

Code Tape (T20): Or, you can start right out at 20 wpm and master it in a weekend. \$5 (#43)

Wayne Un-Dayton Talk: This is a 90-minute tape of the talk I'd have given at the Dayton, if invited. \$5 (#50)

Wayne Tampa Talk: This is the talk I gave at the Tampa Global Sciences conference—where I cover amateur radio, cold fusion, health, books you should read, and so on. \$5 (#51)

\$1 Million Sales Video: The secret of how you can generate an extra million dollars in sales just by using PR. This will be one of the best investments you or your business will ever make. \$40 (#52)

Reprints of My Editorials from 73. Very few things in this world are as we've been taught, and as they appear. I blow the whistle on the scams around us, such as the health care, our school system, our money, the drug war, a college education, sugar, the food giants, our unhealthy food, fluorides, EMFs, NutraSweet, etc.

1996 Editorials: 120 pages, 100 choice editorials. \$10 (#72)

1997 Editorials: 148 fun-packed pages, 216 editorials. \$10 (#74)

1998 Editorials: 168 pages that'll give you lots of controversial things to talk about on the air. \$10 (#75)

1999 Editorials: 132 pages of ideas, book reviews, health, education, and anything else I think you ought to know about. \$10 (#76)

2000 Editorials: In the works.

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Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 100,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The 73 Flea Market, Barter 'n' Buy, costs you peanuts (almost)—comes to 35 cents a word for individual (noncommercial!) ads and \$1.00 a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad.

This is a monthly magazine, not a daily newspaper, so figure a couple months before the action starts; then be prepared. If you get too many calls, you priced it low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right and maybe you can help make a ham newcomer or retired old timer happy with that rig you're not using now. Or you might get busy on your computer and put together a list of small gear/parts to send to those interested?

Send your ads and payment to: 73 Magazine, Barter 'n' Buy, 70 Hancock Rd., Peterborough NH 03458 and get set for the phone calls. The deadline for the January 2001 classified ad section is November 10, 2000.

President Clinton probably doesn't have a copy of *Tormet's Electronics Bench Reference* but you should. Check it out at [www.ohio.net/~tormet/index.htm]
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NEVER SAY DIE

continued from page 62

blue stuff. Yes, of course it's been okayed by the FDA. So how did something that's making so many people sick, and causing them to gain weight in the bargain, get the FDA stamp of approval?

Aspartame was originally discovered at G.D. Searle in 1965. The company submitted some tests to the FDA, which okayed it in 1974. In 1985, Searle was acquired by Monsanto. Despite thousands of complaints both Monsanto and the FDA continue to defend aspartame, which is a major moneymaker, used in thousands of products ... notably in diet drinks.

I have a small two-for-a-buck booklet available that you can give to anyone you know who is using NutraSweet products to alert them.

"Brick-Wall" Selectivity

Today's elite-class operators demand the best RF weaponry available. Yaesu's exciting new MARK-V FT-1000MP answers the call, with an expanded array of receiver filtering, 200 Watts of power output, and Class-A SSB operation capability for the cleanest signal on the band. Enhanced front-panel ergonomics save you seconds in a pile-up or a contest "run," and Yaesu's HF design and manufacturing know-how ensures that no short-cuts have been taken in our effort to bring you the best HF transceiver money can buy. For more QSOs in your log, and more awards on your wall, there is only one choice: the MARK-V FT-1000MP from Yaesu!

I. IDBT: Interlocked Digital Bandwidth Tracking System

The IDBT feature greatly simplifies operation by matching the bandwidth of the DSP (Digital Signal Processing) system to the net bandwidth of the 8.2 MHz and 455 kHz IF stages. The IDBT system accounts for the settings of the IF WIDTH and SHIFT controls, and automatically sets a DSP bandwidth which matches the analog IF bandwidth.

II. VRF: Variable RF Front-End Filter

Protecting the MARK-V's receiver components from strong out-of-band signals, the VRF system acts as a high-Q "Preselector," located between the antenna and the main bandpass filter networks, providing additional RF selectivity on the 160-20 meter Amateur bands for multi-operator contest teams, DX-peditions, or for operation near MW/SW broadcast stations.

III. 200 Watts of Transmitter Power Output

Utilizing two Philips® BLF147 Power MOSFETs in a 30-Volt, push-pull configuration, the MARK-V's transmitter puts out up to 200 Watts of clean output power, thanks to the conservative design of the PA section.

IV. Class-A SSB Operation

Exclusively available on the MARK-V FT-1000MP, a press of a front-panel button engages Class-A SSB operation of the transmitter, at a power output level of 75 Watts. Class-A operation produces incredibly clean signal quality, with 3rd-order IMD suppressed 50 dB or more, and 5th- and higher-order products typically down 80 dB or more!

V. Multi-Function Shuttle Jog Tuning/Control Ring

The immensely-popular Shuttle Jog tuning ring, which is concentric with the Main Tuning Knob, has a new look in the MARK-V: it now includes the activation switches for the VRF (left side) and IDBT (right side) features, so you don't have to move your hand position to activate these important circuits during contest or pile-up situations!



Class A 75 W PEP IMD

IDBT: A Breakthrough in Selectivity!



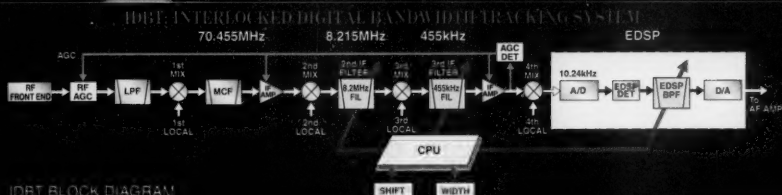
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Power Supply PP-29

Photo shows optional MD-100AAX Deluxe Desk Microphone

HF 200 W All-Mode Transceiver

MARK-V FT-1000MP

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